

1.9321
N2L69
Cap. 3

U.S. DEPT. OF AGRICULTURE
NATL. ARCH. LIBRARY

NORTHERN

Marketing and Nutrition Research Division

Publications and Patents

July - December 1970

**Agricultural Research Service
United States Department of Agriculture**

CONTENTS

	Page
Request for Information	3
Subject Index	4
Author Index	11
Publications	15
Republications	66
Unofficial Publications	66
Contract and Grant Research Publications	67
Patents	72
Licensing of Patents	75

Northern Marketing and Nutrition Research Division
Agricultural Research Service
United States Department of Agriculture
1815 North University
Peoria, Ill. 61604

REQUEST FOR INFORMATION

The results of the research of the Northern Marketing and Nutrition Research Division¹ are published regularly in the technical literature, and public-service patents are secured to cover patentable inventions and discoveries (see page 72). As a convenient guide to our publications and patents, a list with abstracts is published semiannually. The abstracts describe the current research and indicate the progress achieved. Further information on any of the developments, as well as earlier technical papers, may be obtained by writing us.

In conformance with the policy of the Department of Agriculture, Northern Division publications are available to scientists and other specialists, librarians, representatives of the press, and others interested.

Reference to commercial equipment or proprietary products is made as part of the exact experimental conditions. Naming a company or product does not imply approval or

recommendation by the U.S. Department of Agriculture over others not mentioned.

Requests for specific reprints should be by number and addressed to the Northern Division. Those titles marked with an asterisk [*] are not available for distribution

Most of the publications are in journals that are available in libraries. Photographic copies of most journal articles on research at this Division can be purchased from the National Agricultural Library of the U.S. Department of Agriculture, Washington, D.C. 20250.

No publications will be sent regularly in response to foreign requests unless exchange arrangements have been made with the Director of the National Agricultural Library.

Copies of previous lists of publications and patents are available upon request.

¹Formerly designated as the Northern Utilization Research and Development Division

July-December 1970

.

SUBJECT INDEX FOR PUBLICATIONS AND PATENTS

[Compiled by reprint order number. Numbers marked (*) do not have reprints available for distribution.]

CEREAL GRAINS

General

Acetylated sugar derivatives, NMR spectra of: 2732
Aldosyl chlorides, by reaction with zinc chloride-thionyl: 77-G*
Alkaline medium, calcium sequestration in; U.S. 3,536,630
Amino acid analyses, internal standard for: U.S. 3,531,490
Carbohydrates, debenzylation of: 232-C*
Carbohydrate sulfonates, displacement of: 2814
Coating device, to apply varying thickness: U.S. 3,522,792
Computerized maintenance for paper machine: 2730
Debenzylation of alkylated carbohydrates: 232-C*
Epoxypropyl-derivatized sugars, preparation of: 2754
Fructose, thermal degradation of: 2836
Glucofuranose, derivatives for paper production: U.S. 3,528,880
Glucopyranoside, adduct of: 2797
 cyclic carbonate derivative of: 2719
Glycosyl leaving groups, monosaccharides as: 73-G*
Methyl 4,6-O-benzylidene- β -D-glucopyranoside, adduct of: 2797
Methyl maltosides, routes to substituted: 2829
 thin-layer chromatography of: 2749
Methyl terminal-4-O-methylmalto-oligosaccharides: 233-C*
Paper machine, computerized maintenance for: 2730
Publications and Patents of Northern Division, January-June 1970: 2739
Scanning electron microscopy of microorganisms: 2752*
Strontium-90, reduction of: U.S. 3,522,056
Sulfonate displacement with halide ions: 2814
Thermal degradation of fructose: 2836
Unsaturated sugars, methylene-insertion reactions with: 80-G
 preparation of: 2731
Vinyl esters, infrared absorption spectra of: 2830
Zinc chloride-thionyl chloride, reaction of peracetates with: 77-G*

Starch

Amylose films, water-soluble: U.S. 3,549,619
 Amylose, x-ray diffraction of complex: 2747
 Barley genotypes, studies on starches of: 310-F
 Carbamoylethyl starch, wet- and dry-strength agent for paper: 2761
 Carbonyl groups, determined by polarographic techniques: 318-F
 Cellulosic pulp, retention of starch and pigment color in: 2744
 Detergent formulations, polyelectrolytes as builders: 2842
 Fatty acid derivatives, retention aid in cellulosic pulp: 2744
 Films, water-soluble for food packaging: U.S. 3,549,619
 Flocculants, products for: 2802
 Flour, fluidization in stirred, aerated bed: 2777*
 Glucopyranoside, cyclic carbonate derivative of: 2719
 Graft copolymers tested as flocculating agents: 2832
 HA starch, modified under influence of temperature: 309-F
 Levoglucosan, production by pyrolysis in inert gas stream: 76-G*
 Paper additives: 2761; 2801; U.S. 3,522,238; U.S. 3,536,579;
 U.S. 3,542,644
 Phenylenediamine, reaction of oxidized starches with: 318-F
 Plastics, products for: 2802
 Polarographic techniques, determination of carbonyl groups: 318-F
 Polyacrolein, reaction with xanthate: 2717
 Polyamines, reaction with xanthate: 2772
 Pyrodextrinization of corn starch in absence of added catalyst: 312-F
 Reinforced rubbers: 2801; U.S. 3,542,708
 Retention aid in paper, ethylenimine modified flours: U.S. 3,522,238
 Surface sizing trials with acid-modified wheat flour: 2738
 Waxy maize starch, modified under influence of temperature: 309-F
 Xanthate, oxidation by iodine: 2733
 reaction with polyacrolein: 2717
 reaction with low-molecular-weight polyamines: 2772

Wheat

Alcohol, industrial: 2799
 production economics of: 2790*
 Ascorbic acid, stability in blends: 2759
 Chromatographic determination of residues in proteins: 2737
 Flour, fluidization in stirred, aerated bed: 2777*
 Gliadin and glutenin, comparison of peptides from: 2725
 Gliadin proteins, chromatographic comparisons of: 2726
 Gluten hydrolyzate derivatives: U.S. 3,522,197
 Gluten, nonfood uses of: 2803
 Gluten protein, graft photopolymerization of styrene to: 2763
 Graft copolymers, tested as flocculating agents: 2832
 Industrial adoptions and accomplishments: 2798
 Ochratoxin A, occurrence in wheat: 2780*
 Peptides and proteins, N- and C-alkylation of: 2715

Polypeptides, photoaddition of DMSO to: 2784
 Protein isolation and characterization, newer techniques of: 2756
 Surface sizing trials with acid-modified flour: 2738
 Wheat straw, pulp and paper from: 2800
 Yeasts from wheat and flour: 2729

Corn, Sorghum, and Other Grains

Amylose determinations in DMSO: 2727
 films, water-soluble: U.S. 3,549,619
 Ascorbic acid, stability in blends: 2759
 Barley genotypes, studies on starches of: 310-F
 Cellulosic pulp, retention of corn starch and pigment color in: 2744
 Corn, dent, lysine fortification of: 2794
 dry milling industry: 2827*
 endosperm, origin and development of protein granules: 2812
 endosperm protein, glass knife sectioning: 2821
 fermentation and distilling industries: 2828*
 food uses around the world: 2825*
 in perspective: 2822*
 germ, linoleic acid oxidation in: 2735
 germ, lipooxygenase from *Zea mays*: 2748
 glutelin proteins, extraction and structure studies: 2758
 kernel, structure, composition, and quality: 2824*
 kernel, tocopherol distribution within: 2757
 mycotoxin from blue-eye mold of: 2740
 production and marketing economics: 2823*
 reducing microbial populations in dry-milled products: 2834
 starch, pyrodextrinization in absence of catalyst: 312-F
 wet-milling industry: 2826*
 Fatty acid derivatives, retention aid in cellulosic pulp: 2744
 Flour, fluidization in stirred, aerated bed: 2777*
 HA starch, modified under influence of temperature: 309-F
 Linoleic acid, oxidation by sequential enzymes: 2735
 Sorghum grain, amino acid composition of: 226-C*
 energy value of: 226-C*
 Waxy maize starch, modified under influence of temperature: 309-F

Fermentative Conversion and Microbiology

Actinomycetales, new names and new combinations: 2808
 Aflatoxicol, new transformation production of aflatoxin B₁: 2722
 Aflatoxin B₁, effect on enzyme biosynthesis: 2806
 induction of lysogenic bacteria: 2831
 in *Aspergillus parasiticus*, biosynthesis of: 2779
 Aflatoxins M₁ and M₂, preparation and purification: 2782
 Aflatoxin, detoxification in corn by ensiling: 2723
 formation in meats: 2751*
 production by *Aspergillus flavus* series: 2796*

Alcohol, production economics of: 2790*; 2799
Bacillus popilliae, role of barbituric acid in nutrition of: 229-C
 Blue-eye fungi, penicillic acid production by: 2740; 2830
Candida lipolytica, sexuality in: 2819
Candida tropicalis, influence of acceptor by transglucosylamylase: 2813
Citeromyces Santa Maria: 2815
 Coomassie Brilliant Blue and Amido Black, comparison for detection
 of whey protein bands: 74-G*
 Fungal glucoamylase, incorporation of ^{14}C into carbohydrate
 moieties of: 79-G*
 Fungal toxins: 2736*
 Glucoamylase from *Aspergillus phoenicis*: 78-G*
Hansenula H. et P. Sydow: 2816*
 sydowiorum, metabolic product of: 2734
 taxonomic characteristics in: 2818
 wingei, association constant of agglutinin: 2720
 Hydroxyhexadecanoic acid, metabolic product of yeast: 2734
Kluyveromyces lactis, sex-specific growth response in: 2728
 Microorganisms, scanning electron microscopy of: 2752*
 Mycotoxin, from blue-eye mold of corn: 2740; 2830
 occurrence in *Aspergillus*: 2795*
 ochratoxin A, occurrence in wheat: 2780*
 produced by *Fusarium tricinatum*, assays for: 2778
Pachysolen Boidin et Adzet: 2817*
 Penicillic acid, fluorodensitometric assay of: 2791
 production by blue-eye fungi: 2740; 2830
 Polysaccharide from *Xanthomonas campestris*: 2718
Rhizopus oligosporus protease, multiple forms of: 2793
 Sporeforming bacteria, lipids of vegetative cells: 2833
Sporobolomyces yeast, cross-reactions of acetyl phosphogalactan: 2837
 Transglucosyl-amyase, substrate inhibition by maltose: 2787
 Tremorgenic toxins from *Penicillia*: 2809
 Tremortins A and B, colorimetric determination of: 2809
 Viridicatin from *Penicillium palitans*, isolation of: 2811
 Whey protein bands, detection after disc electrophoresis: 74-G*
 Yeast phosphohexosans, variation in composition of: 2714
 Yeasts from wheat and flour: 2729

OILSEEDS

General

Aliphatic aldehydes, electron-impact reactions of: 2745
 Carboxylic acids, infrared absorption spectra of vinyl esters: 2820
 Chemically modified oil products for industrial use, 1962-69
 publications and patents: 2768
 Chromium-tricarbonyl complexes, stereoselective hydrogenation: 2840
 Compositional studies on oilseeds, oils, and meal, 1962-69
 publications and patents: 2764

- Coordination chemistry, recent developments in: 231-C*
- Engineering studies on processing oils and meals, 1962-69
publications and patents: 2765
- Hydrogenation, of fatty esters with copper-chromite catalyst: 2838
with chromium tricarbonyl complexes: 2840
with copper catalysts, hydrogen addition and isomerization: 2743
with copper catalysts, isomer isolation and identification: 2741
with copper catalysts, kinetics: 2742
of vegetable oils, *cis*-retaining: U.S. 3,542,821
- Lipid analysis, microreactions for: 2750
- Mass spectrometry, analysis of triglyceride mixtures: 2835
- Methyl octadecadienoate, method for preparation: 2746
- Miscellaneous studies related to soybean and other oilseed crops,
1962-69 publications and patents: 2770
- Review articles on oilseed crops research, 1962-69 publications: 2769

Linseed Oil

- Coatings, diisocyanate-modified polymers, color stability of: 2776
- Hydrogen sulfide, free radical addition of: 2781
- Sedimentation volumes of pigments, solubility parameters
applied to: 2775

Soybean Oil

- Chemically modified oil products for industrial use, 1962-69
publications and patents: 2768
- Chromium tricarbonyl complexes, stereoselective hydrogenation: 2840
- Coatings, diisocyanate-modified polymers, color stability of: 2776
- Edible soybean oil, 1962-69 publications and patents: 2766
- Engineering studies on processing oils and meals, 1962-69
publications and patents: 2765
- Flame photometry, determination of sodium by: 2755
- Flavor evaluation of copper-hydrogenated oil: 2839
- Hydrogen sulfide, free radical addition of: 2781
- New developments enhance use: 2786*
- Unsaturated fatty esters, interaction of tocopherols with: 316-F
- Volatiles, tandem gas chromatography-mass spectrometry analysis: 2783

Soybean Meal and Protein

- Agglutinin and animal cell surfaces, inhibition of interaction: 317-F
- Ascorbic acid, stability in blends: 2759
- Chromatographic determination of residues in proteins: 2737
- Defatted flakes, miso-type products by using: 314-F
- Edible soybean protein, 1962-69 publications and patents: 2767
- Engineering studies on processing oils and meals, 1962-69
publications and patents: 2765
- Extruder processing, improves full-fat flour: 2810

Food opportunities through research: 2789
 Galactosamine inhibition of soybean agglutinin and animal cells: 317-F
 Kori-tofu, studies on browning of: 311-F
 Microbial acid protease, properties of protein treated with: 315-F
 Miso-type productions, using defatted soybean flakes: 314-F
 Oligosaccharides, acid hydrolysis at isoelectric point: 319-F
 decomposition by intestinal bacteria: 320-F; 321-F
 Peptide, bitterness in relation to chemical structure: 313-F
 Protein, newer techniques of isolation and characterization: 2756
 products, flavor and flatulence factors in: 2805; 2843
 functional, chemical, and physical properties of: 2804
 Proteolytic enzyme, application to soybean protein: 313-F; 315-F

Fermentative Conversion and Microbiology

Escherichia coli, formation of organic acids from sugar mixture: 320-F
 galactosidase activity of: 321-F
 Fermentation methods developed for sufu and lao-chao: 2721
 Kori-tofu, studies on browning of: 311-F
 Sufu and lao-chao, Oriental fermented foods: 2721

NEW CROPS

General

Fatty acids in plants, occurrence of unusual: 2792*
Fusarium tricinctum, cattle disease caused by: 2724
 Mycotoxins, produced by *Fusarium tricinctum*: 2778
 Nuclear magnetic resonance spectra of sugar derivatives: 2732
 Unsaturated nitro sugars, preparation of: 2731

Oilseeds

Chemically modified oil products for industrial use, 1962-69
 publications and patents: 2768
 Compositional studies on oilseeds, oils, and meals, 1962-69
 publications and patents: 2764
 Crambe meal protein and hulls in cattle rations: 2771
 Cyanolipids of *Cardiospermum halicacabum*: 2788
 of *Koeleruteria paniculata* seed oil: 2774
 of Sapindaceous seed oils: 2788
 of *Stocksia brahuica* seed oil: 2753
 Diastereomeric episulfides, ir and nmr study of: 2785
 Engineering studies on processing oils and meals, 1962-69
 publications and patents: 2765
 Epoxy oils from plant seeds: 2841
 Mass spectrometry, analysis of triglyceride mixtures: 2835

Miscellaneous studies on soybean and other oilseed crops, 1962-69
publications and patents: 2770

Monnina emarginata, glycerides of seed oil: 2807

14-membered-ring compound from: 2716

seed oil, fatty acids of: 2773

Review articles on oilseed crops research, 1962-69 publications: 2769

Thioglucosidase activity of *Crambe* seed, effect of reducing
agents and ferrous ion on: 2762

Pulping Crops

Papermaking fiber, search for sources of: 2760

July-December 1970

.

AUTHOR INDEX FOR PUBLICATIONS AND PATENTS

A

Albrecht, W. J.: 2810
 Anderson, J.: 2843
 Anderson, R. A.: 2826*; U.S.
 3,522,056
 Arai, S.: 313-F, 315-F
 Aranyi, C.: U.S. 3,522,197

B

Babcock, G. E.: 2714; 2718
 Bailar, J. C., Jr.: 231-C*
 Baker, B. G.: 2836
 Banks, W.: 310-F
 Barnhart, J. L.: 74-G*
 Bathurst, J.: 226-C*
 Baumann, W. E.: 78-G*
 BeMiller, J. N.: 232-C*; 233-C*
 Bennett, G. A.: 2833
 Bietz, J. A.: 2725; 2726
 Bitner, E. D.: 2750
 Black, L. T.: 2755
 Blessin, C. W.: 2757; 2794
 Blinc, M.: 309-F
 Bookwalter, G. N.: 2810
 Brekke, O. L.: 2827*
 Brekken, R. A.: 2777*
 Bulla, L. A., Jr.: 2752*; 2833
 Burmeister, H. R.: 2751*; 2778
 Burr, R. C.: 2832
 Butterfield, R. O.: 2742

C

Carlson, C. W.: 2795*
 Carlson, K. D.: 2731; 2732; 2785

Cavins, J. F.: 2737; 2794;
 U.S. 3,531,490
 Chang, C. J.: 73-G*
 Ciegler, A.: 2723; 2736*; 2740;
 2791; 2806; 2809; 2811; 2830; 2831
 Cimerman, A.: 309-F
 Clanton, D. C.: 2771
 Clark, T. F.: 2760
 Costilow, R. N.: 229-C
 Coulter, W. H.: 229-C
 Cowan, J. C.: 2786*; 2839; 2840
 Crespi, M. J.: 231-C*
 Cunningham, B. A.: 74-G*
 Cunningham, R. L.: 2760

D

Dave, G. B.: 312-F
 Daxenbichler, M. E.: 2785
 Deatherage, W. L.: 2794
 Delfel, N. E.: U.S. 3,522,792
 Detroy, R. W.: 2722; 2736; 2779
 Deyoe, C. W.: 226-C*
 Diamant, J.: 314-F
 Dimler, R. J.: 2727; 2789; 2798
 Dintzis, F. R.: 2718
 Doane, W. M.: 2719; 2733; 2754;
 U.S. 3,528,880; U.S. 3,536,579
 Douglas, J. A.: 2717; 2772;
 U.S. 3,542,708
 Dutton, H. J.: 2742; 2750; 2839
 Dwoskin, P. B.: 2823*

E

Earle, F. R.: 2841
 Egan, L. P.: 77-G*

Eissler, R. L.: 2775
 Ellis, J. J.: 2724; 2796*
 Eskins, K.: 2763; 2784
 Evans, C. D.: 2839

F

Fanta, G. F.: 2832
 Fennell, D. I.: 2780*
 Fenselau, C.: 2745
 Fish, N. L.: 74-G*
 Frankel, E. N.: 2840; U.S.
 3,542,821
 Friedman, M.: 2715; 2737; 2763;
 2784; U.S. 3,531,490
 Fujimaki, M.: 311-F; 313-F; 315-F

G

Garcia, W. J.: 2727
 Gardner, H. W.: 2735; 2748
 Gast, L. E.: 2776; 2781
 Geldard, J.: 231-C*
 Goodwin, J. C.: 2797
 Gordon, S. H.: 2761; U.S.
 3,542,644
 Grams, G. W.: 2757
 Greenwood, C. T.: 310-F
 Griffin, E. L., Jr.: 2810; 2834
 Grove, M. D.: 2724
 Gutfreund, K.: U.S. 3,522,197

H

Harada, I.: 316-F
 Harshfield, G. S.: 2795*
 Harwig, J.: 2780*
 Hawrylewicz, E. J.: U.S. 3,522,197
 Heidelberger, M.: 2837
 Hensley, D. E.: 2714
 Herman, A. I.: 2728; 2819
 Hesseltine, C. W.: 2721; 2722;
 2729; 2778; 2779; 2793; 2795;
 2796; 2809
 Hites, R. A.: 2835
 Hodge, J. E.: 2836

Hoelscher, H. E.: 76-G*
 Hofreiter, B. T.: 2730
 Homma, S.: 311-F
 Honig, D. H.: 2805
 Horton, J. E.: 2836
 Hou, C. T.: 2809; 2811
 Huebner, F. R.: 2726

I

Ilany-Feigenbaum, J.: 314-F
 Inglett, G. E.: 2757; 2794; 2822;
 2824; 2825; 2828*
 Itatani, H.: 231-C*

J

James, C.: 2758
 Jones, Q.: 2760
 Junker, M. L.: 2772

K

Kasai, T.: 320-F; 321-F
 Kato, H.: 311-F; 313-F; 315-F
 Katz, H. C.: U.S. 3,542,644
 Kawamura, S.: 319-F; 320-F; 321-F
 Khoo, U.: 2812; 2821
 Komoda, M.: 316-F
 Koritala, S.: 2741; 2742; 2743;
 2746; 2838; 2839
 Kosuri, N. R.: 2724
 Krull, L. H.: 2715; 2737
 Kurtzman, C. P.: 2729; 2740; 2791;
 2819; 2830
 Kwolek, W. F.: 2727; 2760; 2795;
 2810

L

Lakshmanan, C. M.: 76-G*
 Lambert, J. L.: 2771
 Lancaster, E. B.: 2777*
 Landis, W. R.: 2745
 Lanser, A. C.: 2750

Laxer, S.: 314-F
 Lehrfeld, J.: 2797
 Leistner, L.: 2751*
 Leitch, L. C.: 2745
 Liang, D.: 226-C*
 Lillehoj, E. B.: 2736*; 2806; 2831
 Lindenfelser, L. A.: 2723
 Lineback, D. R.: 78-G*; 79-G*
 Lis, H.: 317-F
 List, G. R.: 2839

M

McGhee, J. E.: 2810
 McGuire, T. A.: 2744; 2842
 McManis, G. E.: 2776; 2820
 Maher, G. G.: 2717; 2772; U.S.
 3,542,708
 Mark, A. M.: 2842; U.S. 3,549,619
 Mehltretter, C. L.: 2744; 2812;
 U.S. 3,536,630; U.S. 3,549,619
 Melvin, E. H.: 2727
 Meyers, C. Y.: 232-C*
 Meyerson, S.: 2745
 Mickelsen, R.: 74-G*
 Mikolajczak, K. L.: 2753; 2774;
 2788
 Miller, D. L.: 2790*; 2799; 2800
 Miller, G. D.: 226-C*
 Mills, F. D.: 2836
 Mizutani, M.: 318-F
 Moore, C. A.: 2823*
 Moser, H. A.: 2783; 2839
 Moulton, K. J.: 2839
 Murphy, L. S.: 226-C*
 Mustakas, G. C.: 2771; 2810

N

Nakamura, L. K.: 2787; 2813
 Nichols, R. E.: 2724
 Nielsen, H. C.: 2758
 Nienaber, N.: 73-G*
 Nishio, T.: 318-F
 Noguchi, M.: 315-F

O

Ono, S.: 318-F
 Orton, W. L.: 2720

P

Parmar, R. S.: 312-F
 Paulis, J. W.: 2758
 Pearl, S. L.: 2843
 Pertot, E.: 309-F
 Pfeifer, V. F.: 2759; 2834;
 U.S. 3,522,056
 Phillips, B. E.: 2716; 2773; 2807
 Pinsky, A.: 314-F
 Pridham, T. G.: 2808

R

Rackis, J. J.: 2805; 2843
 Rankin, J. C.: 2738; U.S. 3,522,238
 Rist, C. E.: 2717; 2719; 2733;
 2754; 2761; 2772; 2802; 2832
 Robbins, P. J.: 2738
 Rohwedder, W. K.: 2734; 2783
 Rothfus, J. A.: 2725; 2726; 2756
 Russell, C. R.: 2717; 2719; 2733;
 2761; 2772; 2801; 2802; U.S.
 3,522,238
 Russell, I. J.: 79-G*

S

Sachs, L.: 317-F
 Safranski, M. J.: 2714
 Sanford, P. E.: 226-C*
 Schneider, W. J.: 2776
 Scholfield, C. R.: 2741; 2746
 Schwab, A. W.: 2781
 Scott, D. B.: 2734
 Scott, P. M.: 2780*
 Sela, B.-A.: 317-F
 Selke, E.: 2745; 2783
 Semeniuk, G.: 2795*
 Sessa, D. J.: 2805; 2843

Shannon, G. M.: 2782; 2796*
 Sharon, N.: 317-F
 Shasha, B. S.: 2733; U.S.
 3,528,880; U.S. 3,536,579
 Shimizu, T.: 2843
 Shotwell, O. L.: 2782; 2796*; 2833
 Shoup, F. K.: 226-C*
 Simpson, T. D.: 2747
 Sinclair, H. B.: 2749; 2814; 2829
 Sleeter, R. T.: 2749; 2829
 Slodki, M. E.: 2714; 2837
 Smith, C. R., Jr.: 2716; 2731;
 2732; 2753; 2773; 2774; 2788;
 2792*; 2807
 Smith, H. E.: 2761; U.S. 3,542,644
 Smith, M.: 2796*
 Squires, T. G.: 77-G*
 Srivastava, H. C.: 312-F
 Steggerda, F. R.: 2805; 2843
 Stodola, F. H.: 2734
 Stolp, J. A.: 2775
 Stout, E. I.: U.S. 3,536,579
 Stubblefield, R. D.: 2782
 Stucin, D.: 309-F
 Suzuki, N.: 311-F
 Swain, E. W.: 2776

T

Tada, M.: 319-F
 Tada, R.: 320-F
 Takagi, M.: 318-F
 Tallent, W. H.: 2724
 Tanusi, S.: 319-F
 Taylor, N. W.: 2720
 Thomas, F. L.: 2840
 Tindall, C. G., Jr.: 80-G
 Tjarks, L. W.: 2716; 2753; 2773;
 2774; 2788
 Tobin, R.: 2718
 Tookey, H. L.: 2762
 Torigoe, H.: 321-F
 Trimnell, D.: 2719
 Turner, M. E.: 74-G*

V

Vandegraft, E.: 2796*
 Vercellotti, J. R.: 73-G*; 77-G*
 Vesonder, R. F.: 2734
 Vojnovich, C.: 2759; 2834

W

Walbeek, W. van: 2780*
 Walker, J. T.: 310-F
 Wall, J. S.: 2758; U.S. 3,522,197
 Wang, H. L.: 2721; 2793
 Webber, R. A.: 2738
 Weisleder, D.: 2748; 2785
 Wheelock, T. D.: 2777*
 Wickerham, L. J.: 2729; 2815
 2816*; 2817*; 2818; 2819
 Wilham, C. A.: 2744; 2842
 Williams, W. L.: 2730
 Wing, R. E.: 2754; 232-C*; 233-C*
 Wolf, M. J.: 2727; 2812; 2821
 Wolf, W. J.: 2804
 Wolff, I. A.: 2724; 2731; 2732;
 2760; 2762; 2771

Y

Yamashita, M.: 313-F; 315-F
 Yates, S. G.: 2724
 Young, J. L.: 2745

Z

Zgol, R.: 2775

July-December 1970

.

PUBLICATIONS

[Publications marked with an asterisk (*) are not available for distribution. When requesting reprints, please order by number. Use your zip code.]

- 2714 • Variation in Composition of Yeast Phosphohexosans
M. E. Slodki, M. J. Safranski, D. E. Hensley,
and G. E. Babcock
Appl. Microbiol. 19(6): 1019-1020. June 1970

Limitation of KH_2PO_4 or its omission from complex culture media leads to production of altered phosphohexosans or neutral extracellular mannans by yeasts that were previously found to elaborate phosphogalactans and phosphomannans. The extracellular phosphogalactan formed on orthophosphate-free medium by *Sporobolomyces* sp. NRRL Y-6493 contains less organic phosphate, but increased amounts of *O*-acetyl and *D*-glucose. Both *Hansenula capsulata* NRRL Y-1842 and *H. holstii* NRRL Y-2448 form neutral α -mannans when orthophosphate is omitted from the culture medium. A lightly phosphorylated product containing two polymeric components is formed when *H. capsulata* is grown in the presence of a limiting amount of orthophosphate.

- 2715 • N- and C-Alkylation of Peptides and Proteins in Dimethyl Sulfoxide
Mendel Friedman and L. H. Krull
Biochim. Biophys. Acta 207(2): 361-363. May 1970

Neutral amino acid residues in wheat gluten proteins participate in anionic graft polymerizations. These residues have two potential sites for anion formation: the nitrogen and the α -carbon of the amide group of the peptide bond. Reactions were carried out on glycine peptides and polypeptides to determine the site of anion formation. The predominate alkylation site is the nitrogen of the amide bond with only traces of α -carbon alkylation.

- 2716 • (S)-13-Hydroxy-*cis*-9,*trans*-11-octadecadienoic Acid Lactone, A 14-Membered-Ring Compound from *Monnina emarginata* Seed Oil
Bruce E. Phillips, Cecil R. Smith, Jr., and Larry W. Tjarks
J. Org. Chem. 35(6): 1916-1919. June 1970

The oil extracted from *Monnina emarginata* seed contained 4% (S)-13-hydroxy-*cis*-9,*trans*-11-octadecadienoic acid lactone, coriolide, a 14-membered ring lactone. Mass spectra of the hydrogenated lactone and the derived methyl ester established that the heterocyclic oxygen was bound to C-13 of an 18-carbon acid. Ozonolysis of the methyl dienoloate from the lactone demonstrated that the conjugated diene group involved carbons 9-12. The nuclear magnetic resonance spectrum verified the *cis,trans* configuration of the diene system, as well as the proximity of carboxylate oxygen to the C-13 proton. The plain-positive optical rotatory dispersion curves of the coriolide, the corresponding saturated lactone, and the derived methyl ester indicate they each have an S configuration.

- 2717 • Crosslinking of Starch Xanthate. II. Reaction with Polyacrolein
G. G. Maher, J. A. Douglas, C. R. Russell, and C. E. Rist
J. Polym. Sci., Part A-1, 8(7): 1637-1645. July 1970

The reaction between polyacrolein bisulfite adduct and sodium starch xanthate in aqueous alkali gives a rapid viscosity increase and subsequent gelation. The magnitude and pattern of the viscosity development depend on the degree of substitution of the starch xanthates in the range of 0.12 to 0.45, varying from around 5,000 centipoises (nongelling) for the lowest to more than 100,000 centipoises for the highest. The viscosity patterns developed with the more highly substituted xanthates show a minimum valley after a 20- to 30-minute reaction. Analytical and spectral analyses of solid materials obtained from the ethanol precipitation of the gels indicate that the product is a monothiocarbonate stemming from the elimination of sodium hydrogen sulfide between a xanthate group of the starch and a hydroxyl group of the polyacrolein adduct. A hydrated form of polyacrolein does not react with starch xanthate under the same aqueous alkaline conditions.

- 2718 • Studies on Dilute Solutions and Dispersions of the Polysaccharide from *Xanthomonas campestris* NRRL B-1459
F. R. Dintzis, G. E. Babcock, and R. Tobin
Carbohydr. Res. 13(2): 257-267. May 1970

Some properties of the extracellular polysaccharide produced by the bacterium *Xanthomonas campestris* NRRL B-1459 were measured in partially purified culture fluids and in liquid systems prepared from thoroughly purified and lyophilized material. High intrinsic viscosities resulted from dispersions and solutions of polysaccharide B-1459 in 0.01M ammonium acetate and 4M urea. Heating a dispersion of B-1459 in 4M urea yielded a true macromolecular solution in which the polysaccharide had an apparent molecular weight of approximately 2×10^6 . Light-scattering measurements on culture fluids of B-1459 made 4M in urea gave molecular weights of 13×10^6 and 50×10^6 . Various solution properties and factors that affect the viscosity of dispersions prepared from lyophilized polysaccharide are presented.

- 2719 • Methyl 2,3-Di-O-methyl- α -D-glucopyranoside 4,6-Carbonate
D. Trimnell, W. M. Doane, C. R. Russell, and C. E. Rist
Carbohydr. Res. 13(2): 301-305. May 1970

A new, cyclic carbonate derivative of a carbohydrate, methyl 2,3-di-O-methyl- α -D-glucopyranoside 4,6-carbonate, was prepared from methyl 2,3-di-O-methyl- α -D-glucopyranoside by using ethyl chloroformate and triethylamine. The new compound underwent base-catalyzed ring-opening reactions with ethanol to give acyclic carbonates, which were identified through independent syntheses.

- 2720 • Association Constant of the Sex-Specific Agglutinin in the Yeast, *Hansenula wingei*
Neil W. Taylor and William L. Orton
Biochemistry 9(14): 2931-2934. July 1970

Association constants were determined for absorption of the sex-specific agglutinin from mating type 5 of *Hansenula wingei* by cells of type 21, the opposite mating type. Absorption was determined by following the radio-labeled sulfur in purified agglutinin extracted from cells grown in ^{35}S -labeled medium. Association was proved to be reversible under conditions where cell agglutination was weak, and was inferred to be reversible and faster than agglutination under nearly all conditions. The reactions could be characterized by a single association constant dependent on pH. The standard free energy of association was maximum at pH 4 and was approximately -14.5 kcal/mole of 5-agglutinin particles. This high value indicates cooperation among several binding sites may occur.

- 2721 • Sufu and Lao-Chao
Hwa L. Wang and Clifford W. Hesselstine
J. Agr. Food Chem. 18(4): 572-575. July-August 1970

Pure culture fermentation methods were developed for two century-old Oriental fermented foods--one a soybean product, the other a rice product. Both possess the kind of texture, appearance, and mild flavor to which the people of many areas of the world are accustomed. The many changes that take place during a fermentation process are evaluated.

- 2722 • Aflatoxicol: Structure of a New Transformation Product of Aflatoxin B₁
R. W. Detroy and C. W. Hesselstine
Can. J. Biochem. 48(7): 830-832. July 1970

The incubation of aflatoxin B₁ with a steroid-hydroxylating fungus yielded a cyclopentane ring reduction product with reduced biological activity.

- 2723 • Studies on Aflatoxin Detoxification in Shelled Corn by Ensiling
Lloyd A. Lindenfelser and Alex Ciegler
J. Agr. Food Chem. 18(4): 640-643. July-August 1970

Aflatoxin-contaminated high-moisture corn was ensiled in an attempt to detoxify by acid-catalyzed conversion of aflatoxin B₁ to the comparatively nontoxic B_{2a}. Although moldy corn underwent a lactic fermentation, insufficient acid was produced to transform B₁.

- 2724 • Mycotoxins Produced by *Fusarium tricinctum* as Possible Causes of Cattle Disease
Michael D. Grove, Shelly G. Yates, William H. Tallent, John J. Ellis, Ivan A. Wolff, Narayanarao R. Kosuri,¹ and Roy E. Nichols¹
(¹University of Wisconsin, Madison)
J. Agr. Food Chem. 18(4): 734-736. July-August 1970

Fusarium tricinctum, which frequently occurs on tall fescue grass and on corn, produces 4-acetamido-4-hydroxy-2-butenic acid γ -lactone and 4 β ,15-diacetoxy-8 α -(3-methylbutyryloxy)-12,13-epoxytrichothec-9-en-3 α -ol (T-2 toxin) when grown on laboratory media. The acetamido lactone, prepared synthetically from 4-ethoxy-4-hydroxy-2-butenic acid γ -lactone, was injected intramuscularly at 3.8 mg./kg. into a heifer for 90 days and produced dry gangrene at the end of the tail. This lesion is one of the two most characteristic signs sometimes observed in cattle grazing on tall fescue grass. T-2 toxin, isolated from cultures of *F. tricinctum* grown on Sabouraud's agar, was injected at 0.1 mg./kg. into a steer for 65 days and caused death from internal hemorrhaging similar to that occasionally found in cattle after ingestion of moldy corn.

- 2725 • Comparison of Peptides from Wheat Gliadin and Glutenin
J. A. Bietz and J. A. Rothfus
Cereal Chem. 47(4): 381-392. July 1970

Peptic hydrolysis of gluten proteins is rapid at pH 1.8. Concomitant increases in alpha-amino groups suggest that peptides from gliadin and glutenin have respective average molecular weights of 1,990 and 1,150. Gel filtration, however, shows that the bulk of each digest contains peptides with apparent molecular weights more than 2,000. Size distribution of glutenin peptides is different from that of gliadin peptides. Evidently larger peptide segments occur between pepsin-susceptible bonds in glutenin than in gliadin. Additional pepsin-susceptible bonds are exposed in S-aminoethylgliadin, but reduction and S-aminoethylation produce little change in the digestion of glutenin. Similarities between peptide maps from cation- and anion-exchange chromatography of digests of gliadin, glutenin, and their derivatives suggest that most gluten proteins contain segments of polypeptide sequence that are similar or identical. Gliadin peptides eluted from cation-exchange resins at pH 1.8 are especially rich in glutamic acid and proline but are noticeably deficient in lysine, arginine, cystine, and methionine. Corresponding peptides from glutenin are also rich in glutamic acid and proline; in addition, they contain significant amounts of glycine and cystine. The greatest difference between gliadin and glutenin may reside in peptides that are largely ninhydrin-negative.

- 2726 • Chromatographic Comparisons of Peptic Digests of Individual Gliadin Proteins
J. A. Bietz, F. R. Huebner, and J. A. Rothfus
Cereal Chem. 47(4): 393-404. July 1970

Peptide maps of peptic digests of whole Ponca wheat gliadin and its alpha-, beta-, gamma₁-, and gamma₃-components are similar. Of these proteins, gamma₃-gliadin is most different. Peptide maps from alpha-, beta-, and gamma-gliadins from Red Chief and Comanche wheats also show many similarities both within each variety and between corresponding components. The two gamma-gliadin chromatograms are nearly identical. Definite differences between chromatograms of all components, however, indicate that each protein is unique. Peptide mapping by column chromatography is more sensitive than starch-gel electrophoresis of whole proteins in detecting differences in protein structure. The results support the hypothesis that some amino acid sequences in different gliadin proteins have variable structures but others are the same or very similar. Peptide maps of digests of the reduced and S-aminoethylated proteins suggest that some cysteine residues occur in invariant segments.

2727 • Amylose Determination in Dimethyl Sulfoxide Extracts of Maize

M. J. Wolf, E. H. Melvin, W. J. Garcia, R. J. Dimler, and W. F. Kwolek¹

(¹USDA Biometrical Services, Peoria, Ill.)

Cereal Chem. 47(4): 437-446. July 1970

About 1 g. of corn is ground in 90% dimethyl sulfoxide (9:1 DMSO-water, v/v) and then shaken for 24 hours at room temperature to dissolve most of the starch. After undissolved solids are removed, the starch in 10 ml. of the clear extract is purified by precipitation with ethanol. The DMSO-starch precipitate is redissolved in 50 ml. of 90% DMSO. Starch in this solution is determined polarimetrically in an electronic polarimeter ($[\alpha]_{546}^{25^\circ} = 220^\circ$). Amylose is determined spectrophotometrically on a separate portion of the same solution by measuring the absorbance of the amylose-iodine complex at 615 mμ. Purified linear starch fractions and waxy starch serve as reference standards for calibration.

Amylomaize starches solubilize more readily in 90% DMSO than do either ordinary or waxy starches. However, the method is applicable to determination of amylose in the entire range of corn from ordinary corn to amylomaize. DMSO-extractable substances of germ and pericarp do not interfere with determination of amylose in endosperm starch. In fractional extraction of corn with DMSO, initial amylose content is high and decreases in successive extracts. Selective precipitation of starch with ethanol from crude DMSO extracts is equivalent to conventional solvent extraction as a means of minimizing fatty-acid interference with iodine sorption. Rate of amylose analysis is one and one-half to two determinations per man-hour.

2728 • A Sex-Specific Growth Response in the Yeast *Kluyveromyces lactis*

A. I. Herman

Can. J. Genet. Cytol. 12(1): 66-69. March 1970

In *Kluyveromyces (Saccharomyces) lactis*, stocks of complementary mating type each produce a diffusible agent that specifically affects the cells of the opposite sex. The active agents influence bud orientation and growth in such a way that the cells of opposite mating type bud toward each other. The response occurs when the cells are grown on malt extract medium only; the reaction is not observed during growth on a yeast malt medium.

2729 • Yeasts from Wheat and Flour

C. P. Kurtzman, L. J. Wickerham, and C. W. Hesseltine
Mycologia 62(3): 542-547. May-June 1970

The yeast flora of wheat and flour from six geographical areas was examined. *Cryptococcus albidus* was the most commonly found species on wheat from all six areas, but it was not present in the flours. Additional species from wheat were *Cryptococcus laurentii*, *Rhodotorula glutinis*, *Pichia fermentans*, and *Pichia burtonii*; while species from flour were *Hansenula anomala*, *Pichia farinosa*, *P. burtonii*, *Saccharomyces micro-ellipsodes*, and an unidentified species of *Candida*. The yeastlike mold *Aureobasidium pullulans* was common to both wheat and flour.

2730 • Computerized Maintenance for a Research Paper Machine

W. L. Williams and B. T. Hofreiter
Paper Trade J. 154(32): 39-40. August 1970

A computerized maintenance program has been developed for an experimental papermaking facility to ensure that all components are serviced according to the manufacturer's specifications and recommendations. The computer scheduling of maintenance has been in operation at the Northern Laboratory for approximately 2 years. It has demonstrated both the economic and practical feasibility of such a system.

Although maintenance is scheduled only on a biweekly basis, this period has proved to be sufficient for the experimental facility. To date, no downtime has been directly attributable to lack of adequate machine maintenance.

2731 • Unsaturated Nitro Sugars. Preparation of 4-O-Acetyl-1,2-dideoxy-3,5-O-ethylidene-1-nitro-D-erythro-pent-1-enitol

K. D. Carlson, C. R. Smith, Jr., and I. A. Wolff
Carbohyd. Res. 13(3): 391-402. June 1970

The title compound was prepared from D-glucose in 10-25% overall yield in a 5-step sequence. Condensation of nitromethane with 2,4-O-ethylidene-D-erythrose according to the Sowden-Fischer procedure gave an approximately equimolar mixture of 1-deoxy-3,5-O-ethylidene-1-nitro-D-ribitol and the corresponding D-arabinitol derivative, which were separated by chromatography on silica gel. The mixture of nitrodiols was acetylated to the corresponding diacetates, which were not separated. Attempts were unsuccessful at dehydroacetoxylation of the latter by refluxing in benzene solution with sodium hydrogen carbonate or carbonate bases. However, dehydroacetoxylation occurred during chromatography of the diacetates on silica gel, and this proved to be a satisfactory method for preparing 4-O-acetyl-1,2-dideoxy-3,5-O-ethylidene-1-nitro-D-erythro-pent-1-enitol. New data are given for several previously known intermediate compounds prepared in this study.

- 2732 • N.M.R. Spectra and Benzene-Induced Solvent Shifts.
Acetylated Carbohydrates Substituted with 1,3-*O*-
Ethylidene or Nitro Groups
Kenneth D. Carlson, Cecil R. Smith, Jr., and Ivan A. Wolff
Carbohydr. Res. 13(3): 403-415. June 1970

The nuclear magnetic resonance spectra of six acetylated sugar derivatives are presented and compared on the basis of structural similarities due to the presence of *O*-ethylidene, nitro, or nitroolefinic groups. Definite patterns are observed in the chemical shifts of related protons on 1,3-dioxane rings. Chemical shifts of methyl and methine protons of *O*-ethylidene groups are quite insensitive to structural variations. Benzene-induced shifts relative to carbon tetrachloride or chloroform-*d* are presented. Shielding values (Δ) associated with *O*-acetyl and *O*-ethylidene groups are discussed, and a structure is postulated for the benzene-2-methyl-1,3-dioxane collision complex.

- 2733 • A Sulfenyl Iodide in the Mixture Formed by Oxidation of a
Sugar Xanthate with Iodine
B. S. Shasha, W. M. Doane, C. R. Russell, and C. E. Rist
Carbohydr. Res. 13(3): 457-460. June 1970

In an oxidative mixture of a sugar xanthate with iodine the presence of an unstable sulfenyl iodide (general structure RSI) was proved. Previously sulfenyl iodide had been suggested as a possible intermediate for the oxidation of thiols.

- 2734 • 2-D-Hydroxyhexadecanoic Acid: A Metabolic Product of
the Yeast *Hansenula sydowiorum*
R. F. Vesonder, F. H. Stodola, W. K. Rohwedder, and
D. B. Scott¹
(¹Council for Scientific and Industrial Research,
Pretoria, South Africa)
Can. J. Chem. 48(13): 1985-1986. July 1970

A new species of yeast, *Hansenula sydowiorum*, excreted free α -hydroxy fatty acids when grown on glucose solution. The major component, 2-D-hydroxyhexadecanoic acid, was identified by the mass spectrum of its methyl ester.

2735 • Sequential Enzymes of Linoleic Acid Oxidation in Corn Germ:
Lipoxygenase and Linoleate Hydroperoxide Isomerase

H. W. Gardner

J. Lipid Res. 11(4): 311-321. July 1970

Linoleic acid oxidation catalyzed by lipoxygenase (lipoxidase) activity in extracts of defatted corn germ does not terminate in the product, linoleic acid hydroperoxide, unless the lipoxygenase is first partially purified. If purification is not attempted, the hydroperoxide product exists only as a barely detectable intermediate in the synthesis of three products. One of these was identified as 9-hydroxy-10-oxo-*cis*-12-octadecenoic acid formed from the hydroperoxide by the enzyme, linoleate hydroperoxide isomerase. Another product, 13-hydroxy-10-oxo-*trans*-11-octadecenoic acid, is believed to be formed by an isomerase also. The third product was the linoleate ester of one of the hydroxy-oxo-fatty acids, 9-(*cis*-9,*cis*-12-octadecadienoyl)-10-oxo-*cis*-12-octadecenoic acid. It is not known if the synthesis of the ester is enzyme-catalyzed.

When a mixture of 13-hydroperoxy-*cis*-9,*trans*-11-octadecadienoic acid and 9-hydroperoxy-*trans*-10,*cis*-12-octadecadienoic acid from soybean lipoxygenase oxidation of linoleic acid was used as a substrate, 13-hydroxy-12-oxo-*cis*-9-octadecenoic acid and 9-hydroxy-12-oxo-*trans*-10-octadecenoic acid were formed as the major products of catalysis by linoleate hydroperoxide isomerase(s) from corn. Smaller quantities of 9-hydroxy-10-oxo-*cis*-12-octadecenoic acid and 13-hydroxy-10-oxo-*trans*-11-octadecenoic acid were also formed.

2736* • Fungal Toxins

Eivind B. Lillehoj, Alex Ciegler, and Robert W. Detroy

In "Essays in Toxicology," ed. Frank R. Blood, vol. 2,
chap. 1, pp. 1-136. New York. 1970

Aflatoxin and other mycotoxins are reviewed with emphasis on their occurrence, biochemistry, biosynthesis, and toxicity. The implications of mycotoxins in the carcinogenic process are also considered.

- 2737 • The Chromatographic Determination of Cystine and Cysteine Residues in Proteins as *S*- β -(4-Pyridylethyl)cysteine
M. Friedman, L. H. Krull, and James F. Cavins
J. Biol. Chem. 245(15): 3868-3871. August 1970

Disulfide bonds in proteins and in seed meals were reduced with β -mercaptoethanol to sulfhydryl groups. The generated sulfhydryl groups were then alkylated by treatment with 4-vinylpyridine. The cysteine residues were thus derivatized to *S*-(4-pyridylethyl)-L-cysteine residues. The cysteine derivative is stable to acid hydrolysis and on amino acid analysis by ion exchange elutes just before arginine. Complete modification of sulfhydryl groups permits quantitative determination of cysteine and cystine content (half-cystine residues) of proteins and of seed meals. The sulfhydryl groups of cysteine are the only groups modified when the alkylation is performed on solutions of reduced proteins at pH 7.5 for 90 to 120 minutes with an amount of 4-vinylpyridine equivalent to the mercaptoethanol used for reduction. In order to obtain complete modification of the sulfhydryl groups in seed meals, a longer reaction time, 4.5 hours, and a concentration of 4-vinylpyridine equivalent to 3 times the mercaptoethanol concentration were required.

- 2738 • On-Machine Surface Sizing Trials with Acid-Modified Wheat Flour
J. C. Rankin, R. A. Webber,¹ and P. J. Robbins¹
(¹Brown Company, Berlin, N.H.)
Tappi 53(8): 1482-1485. August 1970

Acid-modified wheat flour was compared with a commercial hypochlorite-oxidized starch in the surface sizing of bond and bag papers on a small commercial fourdrinier machine. The flour product adapted well to vertical size press application, and overall results were equal to those obtained with the reference starch in 5-1/2-hour trials.

- 2739 • Publications and Patents of the Northern Utilization Research and Development Division, January-June 1970
North. Util. Res. Develop. Div.
U.S. Agr. Res. Serv., Unnumb. Pub., 64 pp. [July 1970]

2740 • Mycotoxin from a Blue-Eye Mold of Corn

C. P. Kurtzman and A. Ciegler

Appl. Microbiol. 20(2): 204-207. August 1970

High-moisture yellow dent corn became heavily molded by *Penicillium martensii* after storage for 6 months at 1° C. Mice ingesting corn molded by *P. martensii* died within a few days. The toxin was isolated and identified as penicillic acid. Large quantities of the toxin accumulated over a 3-month period on artificially inoculated corn incubated at temperatures between 1° and 15° C. At higher temperatures, the toxin disappeared within 45 days.

2741 • Selective Hydrogenation with Copper Catalysts: I. Isolation and Identification of Isomers Formed During Hydrogenation of Linolenate

Sambasivarao Koritala and C. R. Scholfield

J. Amer. Oil Chem. Soc. 47(8): 262-265. August 1970

Methyl linolenate was hydrogenated with 10% copper chromite catalyst at 150° C. and atmospheric hydrogen pressure. The product was separated into monoene, diene, and triene fractions by countercurrent distribution. These fractions were further separated into various geometrical isomers. The double bond location in the various fractions was determined by reductive ozonolysis. Double bonds in both *cis* and *trans* monoene fractions, as well as in *cis,trans* and *trans,trans* conjugated dienes, were extensively isomerized. A monoene containing vinylic unsaturation was one of the major products. The nonconjugated dienes were mostly dienes whose double bonds were widely separated. Results are explained on the basis of conjugation of the double bonds in linolenate followed by hydrogen addition.

2742 • Selective Hydrogenation with Copper Catalysts: II. Kinetics

Sambasivarao Koritala, R. O. Butterfield, and H. J. Dutton

J. Amer. Oil Chem. Soc. 47(8): 266-268. August 1970

To explain the unusually high selectivity of copper catalysts toward linolenate, model compounds were hydrogenated (150° C. and atmospheric pressure) and the reaction products analyzed. Products varied depending upon location of the double bonds. Monoenes were not reduced by copper chromite except when the double bond was next to a carboxyl group. Dienes with isolated double bonds also were not reduced. Binary mixtures of model compounds were hydrogenated with copper chromite. From the composition of the initial and final products, a competitive rate ratio of the two compounds was determined. Esters with conjugated double bonds reacted faster than esters containing methylene interrupted double bonds. Kinetic data on the hydrogenation of linolenate indicated conjugation of the double bonds. Simulation of the kinetic data gave competitive reaction rates for the different isomers formed.

2743 • Selective Hydrogenation with Copper Catalysts: III.
Hydrogen Addition and Isomerization

Sambasivarao Koritala

J. Amer. Oil Chem. Soc. 47(8): 269-272. August 1970

β -Eleostearate was found to be reduced by 1,6 addition of hydrogen. Because of the extensive isomerization of conjugated trienes during hydrogenation, the occurrence of 1,2 and 1,4 addition reactions could not be proved. Conjugated dienes were reduced by both 1,2 and 1,4 addition of hydrogen. The double bond distribution in the products formed from linoleate, linolenate, and their isomers was consistent with the assumption that the double bonds in polyunsaturated fatty esters conjugate and then add hydrogen. Extensive isomerization (positional and geometric) of the conjugated double bond systems occurred during hydrogenation. Monoenes were not isomerized under similar conditions of hydrogenation. Since double bond distribution in monoenes formed from linoleate and alkali-isomerized linoleate was identical, indications are that conjugation precedes hydrogenation.

2744 • Cationic Fatty Acid Derivatives Aid Retention of Starch
and Pigment Color in Cellulosic Pulp

C. A. Wilham, C. L. Mehlretter, and T. A. McGuire

J. Amer. Oil Chem. Soc. 47(8): 304. August 1970

Cellulosic pulp in water suspension treated with 0.06% selected cationic fatty acid derivatives at pH 4.5 retained up to 99% of gelatinized corn starch and a pigment color.

2745 • Reactions of Aliphatic Aldehydes Under Electron-Impact

Seymour Meyerson,¹ Catherine Fenselau,² J. L. Young,²

W. R. Landis,³ Edward Selke, and L. C. Leitch⁴

(¹American Oil Co., Whiting, Ind.; ²Johns Hopkins University, Baltimore, Md.; ³National Institutes of Health, Bethesda, Md.;

⁴National Research Council, Ottawa, Ontario, Canada)

Org. Mass Spectrom. 3: 689-707. 1970

The mass spectra of hexanal, heptanal, and nonanal variously labeled with deuterium confirm γ -hydrogen migration and β cleavage as the mechanism leading to $[C_2H_4O]^+$ and $[M-C_2H_4O]^+$, although the data on the latter are complicated by contributions from other, related paths. In addition, they show that three other major primary decomposition products, $[M-C_2H_4]^+$, $[M-H_2O]^+$ and $[C_3H_5O]^+$, all arise in large part by processes involving γ -hydrogen migration to the oxygen atom. The ethylene lost to yield the first of these products consists of the α and β methylene groups. The loss of ethylene most likely occurs by way of a cyclobutanol intermediate, which, via alternative reaction paths, may well contribute to the yields of the other two products as well. These findings further extend the range of parallelism between photochemical and electron-impact-induced reactions.

2746 • A Simple Method for Preparation of Methyl *trans*-10,*cis*-12 Octadecadienoate

C. R. Scholfield and S. Koritala

J. Amer. Oil Chem. Soc. 47(8): 303. August 1970

A simple crystallization procedure is described for the preparation of *trans*-10,*cis*-12 octadecadienoate from methyl esters of alkali-isomerized linoleic acid.

2747 • X-Ray Diffraction of Ethylenediamine-Amylose Complex

T. D. Simpson

Biopolymers 9(9): 1039-1047. September 1970

Solutions of amylose in ethylenediamine yield a crystalline film complex upon evaporation of solvent. The x-ray analysis indicates the presence of a tetragonal-shaped cell with a symmetry approximating that of space group $P2_12_12_1$. The amylose sixfold helix has a diameter of 13.3 Å and a translation period of 8.0 Å. Chemical and physical analyses support a complexing ratio of one ethylenediamine molecule to every two glucose units. The structure is nearly identical to any amylose-dimethyl sulfoxide complex previously examined. The square mode of packing arrangement appears to result from complexation between amylose chains. Such complexing indicates a much greater degree of amylose interaction than is observed in amylose complex structures having a hexagonal close-packing arrangement.

2748 • Lipxygenase from *Zea mays*: 9-D-Hydroperoxy-*trans*-10,*cis*-12-Octadecadienoic Acid from Linoleic Acid

H. W. Gardner and D. Weisleder

Lipids 5(8): 678-683. August 1970

Lipxygenase from the germ of corn, *Zea mays*, oxidized linoleic acid to primarily 9-D-hydroperoxy-*trans*-10,*cis*-12-octadecadienoic acid.

2749 • Thin-Layer Chromatography of Substituted Methyl β -Maltosides

Ronald T. Sleeter and H. B. Sinclair

J. Chromatogr. 49(3): 543-545. June 1970

The thin-layer chromatographic behavior of several substituted methyl β -maltosides is recorded. With substituted maltosides the order of migration varied deoxyiodo>deoxy>sulfonate>acetate.

- 2750 • MRA Microreactions for Lipid Analysis
 E. D. Bitner, Alan C. Lanser, and H. J. Dutton
 Lipids 5(8): 707-712. August 1970

Many types of reactions have been performed on a microscale with the microreactor apparatus (MRA) system, which incorporates a modified soldering gun. Specific procedures developed for some typical reactions include bromination of olive methyl esters, silylation of castor methyl esters, homogeneous reduction of oleic acid, heterogeneous reduction of soybean methyl esters, several methods of methyl ester preparation from soybean fatty acids, and saponification of soybean triglycerides followed by esterification. The reaction chamber of the MRA has been redesigned to increase its versatility and to reduce explosion hazards when diazomethane is used. Advantages of the MRA over other systems are less handling of sample, minimum hazards due to small sample size, and direct injection of products into analytical instruments, such as a gas chromatograph or mass spectrometer.

- 2751* • Aflatoxinbildung in Fleischwaren
 [Aflatoxin Formation in Meats. In German. English summary]
 H. R. Burmeister and L. Leistner¹
 (¹Institut für Bakteriologie und Histologie der Bundesanstalt
 für Fleischforschung, Kulmbach, Germany)
 Die Fleischwirtschaft 50(5): 685. May 1970

Aflatoxin-producing molds *Aspergillus flavus* and *A. parasiticus* do not frequently occur on meats. However, if these molds are present, aflatoxins may be produced in large quantities.

- 2752* • SEM of Microorganisms
 Lee A. Bulla, Jr.
 Micro-Vues 2(2): 1-3. October 1970

Scanning electron microscopy (SEM) is a valuable addition to phase contrast and transmission electron microscopy for investigating gross cell morphology and development. However, the usefulness of SEM for studying fine structure remains to be determined. Compared to the techniques of carbon replication and freeze etching, SEM is limited in examining extreme surface detail. Improved resolution in commercial instruments and refined counting techniques should provide microbiologists with an excellent tool for ultrastructural investigations.

- 2753 • Cyanolipids of *Stocksia brahuica* Benth. Seed Oil
K. L. Mikolajczak, C. R. Smith, Jr., and L. W. Tjarks
Biochim. Biophys. Acta 210(2): 305-314. July 1970

Preliminary data suggested that seed oils of certain sapindaceous plants contain high concentrations of nitrogenous lipids. Consequently, further work was done on the structure of these novel materials. A nitrogen-containing ester fraction (35% of the seed oil) has been isolated from the seed oil of one of these plants, *Stocksia brahuica* Benth., and characterized. These esters are composed of a fatty acid moiety (predominantly C₂₀ monoene) esterified with an isoprenoid hydroxynitrile (3-cyano-2-methyl-prop-2-ene-1-ol). Hydrogenolysis of the ester fraction with a platinum catalyst yields fatty acids and isoamylamine. The saturated hydroxynitrile moiety has been isolated after lithium borohydride reduction of the hydrogenated ester.

- 2754 • Sugars with Reactive Substituents: Preparation of Several Epoxypropyl-Derivatized Sugars
R. E. Wing, W. M. Doane, and C. E. Rist
Carbohydr. Res. 14(2): 267-271. August 1970

Several sugar derivatives were prepared that contain the chemically reactive epoxypropyl group. The preparation of these derivatives is described.

- 2755 • Direct Determination of Sodium in Soybean Oil by Flame Photometry
L. T. Black
J. Amer. Oil Chem. Soc. 47(9): 313-315. September 1970

The correlation of sodium content of alkali-refined soybean oil with the soap content of the oil has been widely accepted by oil processors. We have found that this sodium content can be determined by aspiration of an oil solvent solution directly into a flame emission spectrophotometer. The intensity of the sodium flame emission produced from the oil solution was compared with that from oil standards containing known amounts of sodium soaps. To prepare standards, sodium oleate was dissolved in ethylene glycol followed by the addition of a solvent and soybean oil containing low sodium of known amount; this solution aspirated at a rapid, constant rate. The method is capable of determining sodium at a lower limit of 0.1 p.p.m. with accuracy comparable to that of neutron activation analysis.

- 2756 • Newer Techniques in Protein Isolation and Characterization
John A. Rothfus
J. Amer. Oil Chem. Soc. 47(9): 316-325. September 1970

This review summarizes theory, experimental procedures, and applications of current research methodology in each stage of protein purification from the disruption of seed structures and isolation of protein bodies to cleavage of intermolecular bonds and the purification of individual proteins. Methods for characterizing proteins are discussed in terms of their utility in monitoring protein isolations, disclosing structural features and predicting protein behavior. Specific topics include: the macrostructure of seeds, scanning electron microscopy, particle fractionation by density gradient centrifugation, filtration, association-dissociation of seed proteins, disulfide bonds and other forms of intermolecular bonding, high pressure gel filtration, immunospecific adsorbents or precipitating agents, immunochemical techniques, isoelectric focusing, physical and chemical methods for characterizing proteins, differential thermal analysis, and the determination of polypeptide sequences.

- 2757 • Distribution of Tocopherols Within the Corn Kernel
G. W. Grams, C. W. Blessin, and G. E. Inglett
J. Amer. Oil Chem. Soc. 47(9): 337-339. September 1970

The concentration of tocopherols and tocotrienols in the germ, endosperm, and pericarp of the corn kernel was determined after hand dissection of four dent corn hybrids--normal, early maturing, high oil, and high lysine (*opaque-2*). Among these hybrids the germ fraction contained 70 to 86% and the endosperm fraction contained 27 to 11% of the tocopherols extracted from the whole grain. The endosperm fractions contain all of the measurable tocotrienols occurring in whole corn. In the four hybrids analyzed, the germ fraction contained 94 to 96% of the α -tocopherol extracted from the whole grain. Concentration of α -tocopherol was the highest in the germ fraction of the *opaque-2* hybrid.

- 2758 • Extraction and Structure Studies on Corn Glutelin Proteins
H. C. Nielsen, J. W. Paulis, C. James, and J. S. Wall
Cereal Chem. 47(5): 501-512. September 1970

Various methods were compared for isolating glutelin from the glutelin-starch residue remaining after extraction of salt-soluble and alcohol-soluble proteins from corn endosperm. Glutelin was prepared best by removing starch from the residue either by extraction with 90% dimethyl sulfoxide or by digestion with alpha-amylase. Either procedure yielded glutelin as a residue which was insoluble in even the most potent protein solvents and only became soluble upon disulfide cleavage. Its insolubility and its high cystine content indicate that glutelin is present in corn endosperm in the form of a three-dimensional disulfide crosslinked network. Electrophoresis of the peptide subunits of disulfide-cleaved glutelin shows a range of mobilities between that of zein and the salt-soluble proteins of corn endosperm. Sodium hydroxide (0.1 M) extracted almost all the glutelin from the glutelin-starch residue but degraded the protein, as shown by its diffuse electrophoretic pattern and by loss of cystine and lysine. Aqueous 2-chloroethanol extracted only 30% of the glutelin from the glutelin-starch residue, and gel electrophoresis and amino acid analysis showed that the protein was contaminated with zein.

- 2759 • Stability of Ascorbic Acid in Blends with Wheat Flour, CSM, and Infant Cereals
C. Vojnovich and V. F. Pfeifer
Cereal Sci. Today 15(9): 317-322. September 1970

Storage tests were carried out on ascorbic acid-fortified wheat flour, corn-soya-milk (CSM), and precooked infant cereals. Storage temperatures were 26°, 37°, and 45° C.; moisture contents were varied over limited but different ranges for each food blend; and ascorbic acid was determined at intervals up to 6 months.

Destruction of ascorbic acid in these blends always increased as moisture content or temperature increased. The limiting level of moisture for good storage stability differed for each product. Ascorbic acid coated with 1% ethyl cellulose was effective in fortifying wheat flour and CSM at the more drastic storage conditions. With wheat flour, good stability of ascorbic acid was indicated when storage was at 13.7% moisture at 40° C. or below, and with CSM at 9% moisture at 40° C. or below. Ascorbic acid added to infant cereal after precooking and before drum-drying had poor stability when stored above 5% moisture or at temperatures above 26° C. When infant cereal was precooked, drum-dried, and then dry-mixed with ascorbic acid, stability was satisfactory at temperatures ranging from 26° to 45° C. and moisture from 10.8 to 4.8%.

2760 • A Search for New Fiber Crops. XIII. Laboratory-Scale Pulping Studies Continued

R. L. Cunningham, T. F. Clark, W. F. Kwolek,¹ I. A. Wolff, and Quentin Jones²

(¹USDA Biometrical Serv., Peoria, Ill.; ²USDA Crops Research Div., Beltsville, Md.)

Tappi 53(9): 1697-1700. September 1970

Continuing assessment of nonwoody plants as sources of papermaking fibers has extended to 78 the total number of species evaluated as sulfate pulps. The 36 new species produced screened pulps varying in yields from 38 to 59% while permanganate numbers ranged from 12 to 73. Esparto grasses and some bamboos continue to provide the better resistance to tear. Fifteen species chosen on the basis of analytical screening or earlier pulping data were pulped under conditions expected to produce bleachable grades of sulfate pulps. Pulps from seven of these species had permanganate numbers of 20 or less. Strength indices were determined for pulps from all 78 species. *Stipa tenacissima*, an esparto grass, rated the highest index, 2826, of the series. Grass species, including three bamboos plus *Gynerium sagittatum*, *Lygeum spartum*, and *Sinarundinaria murielae*, occupied the next six positions. Two of the bamboos, *Guadua amplexifolia* and *Arundinaria alpina*, offer tolerance of cold, good pulp yields, and ready bleachability, in addition to pulp strength, that warrant their further consideration. *Cannabis sativa*, hemp, is a good producer of pulpable solids and displays high pulp strength. The lower strength index for *Sorghum alnum*, 21st in the order, might be offset by its excellent drought-resistance, adaptability to a variety of soil types, and its high productivity in the field. The *Hibiscus* genus with four representatives strengthwise between positions 10 and 16 deserves further attention. Within this group, kenaf, *Hibiscus cannabinus*, although 12th in order of strength index, continues as the prime potential crop for pulp because of its good productivity and other agronomic characteristics.

2761 • Wet- and Dry-Strength Agent for Paper Derived from Carbamoylethyl Starch

H. E. Smith, S. H. Gordon, C. R. Russell, and C. E. Rist

Tappi 53(9): 1704-1708. September 1970

A 10- to 16-fold increase in wet-tensile strength, as well as significant increases in dry-tensile and bursting strengths, was obtained in unbleached kraft paper by wet-end addition of hypochlorite-treated carbamoylethyl ethers of starch (CES). Aqueous pastes of these starch ethers were acidified with 6 N sulfuric acid to pH 2 and then treated with commercial sodium hypochlorite solution containing about 5% available chlorine. The hypochlorite-treated starch ether was blended with unbleached softwood kraft pulp at pH 3-4 and immediately transferred to a handsheet mold. The pH of the furnish rose to 6.5-7 on dilution with tap water. In general, maximum strength properties of paper resulted from the use of CES treated with hypochlorite at pH 2. Strength properties decreased as the pH during hypochlorite treatment was increased to 5.

2762 • Effect of Organic Reducing Agents and Ferrous Ion on Thioglucosidase Activity of *Crambe abyssinica* Seed

H. L. Tookey and I. A. Wolff

Can. J. Biochem. 48(9): 1024-1028. September 1970

The addition of L-ascorbate or 2-mercaptoethanol to aged crambe seed meal tends to restore the fresh meal pattern of *epi*-progoitrin hydrolysis to nitriles instead of (*R*)-goitrin. Neither of these reducing agents has an effect on the breakdown of *epi*-progoitrin to goitrin by an insoluble particulate thioglucosidase from crambe meal. The addition of ferrous ion to the insoluble particles results in the conversion of *epi*-progoitrin to (2*S*)-1-cyano-2-hydroxy-3-butene instead of (*R*)-goitrin over a range from pH 3.9 to 6.7.

2763 • Graft Photopolymerization of Styrene to Wheat Gluten Protein in Dimethyl Sulfoxide

Kenneth Eskins and Mendel Friedman

J. Macromol. Sci.-Chem. A4(4): 947-956. July 1970

To determine the suitability of dimethyl sulfoxide (DMSO) as a solvent for photopolymerization, solutions of wheat gluten protein (0.28-0.93% by weight) and styrene (4.13-12.65% by weight) in DMSO were irradiated by a 200-W high-pressure mercury arc lamp from 3 minutes up to 1 hour. Graft copolymers of gluten styrene resulted that contained styrene residues ranging from 2 to 23% by weight. When gluten protein was photolyzed in DMSO alone, a significant amount of sulfur from the solvent was incorporated; however, styrene successfully competed with the solvent for free radical sites. The rate of grafting was directly related to both the concentration of gluten and of styrene. Also, the ratio of grafted polystyrene to gluten in the graft polymer indicated that the grafts were composed of small units of polystyrene.

2764 • Compositional Studies on Oilseeds, Oils, and Meals.

A List of Publications and Patents, 1962-1969

North. Util. Res. Develop. Div.

U.S. Agr. Res. Serv., ARS-71-39, 22 pp. August 1970 [Processed]

2765 • Engineering Studies on Processing of Oils and Meals.

A List of Publications and Patents, 1962-1969

North. Util. Res. Develop. Div.

U.S. Agr. Res. Serv., ARS-71-40, 8 pp. August 1970 [Processed]

- 2766 • Edible Soybean Oil and Related Studies. A List of Publications and Patents, 1962-1969
North. Util. Res. Develop. Div.
U.S. Agr. Res. Serv., ARS-71-41, 26 pp. August 1970 [Processed]

- 2767 • Edible Soybean Protein and Related Studies. A List of Publications and Patents, 1962-1969
North. Util. Res. Develop. Div.
U.S. Agr. Res. Serv., ARS-71-42, 14 pp. August 1970 [Processed]

- 2768 • Chemically Modified Oil Products for Industrial Uses. A List of Publications and Patents, 1962-1969
North. Util. Res. Develop. Div.
U.S. Agr. Res. Serv., ARS-71-43, 26 pp. August 1970 [Processed]

- 2769 • Reviews and General Articles on Oilseed Crops Research. A List of Publications, 1962-1969
North. Util. Res. Develop. Div.
U.S. Agr. Res. Serv., ARS-71-44, 14 pp. August 1970 [Processed]

- 2770 • Miscellaneous Studies Related to Soybean and Other Oilseed Crops. A List of Publications and Patents, 1962-1969
North. Util. Res. Develop. Div.
U.S. Agr. Res. Serv., ARS-71-45, 8 pp. August 1970 [Processed]

- 2771* • Crambe Meal Protein and Hulls in Beef Cattle Rations
J. L. Lambert,¹ D. C. Clanton,¹ I. A. Wolff, and G. C. Mustakas
(¹University of Nebraska North Platte Station, North Platte)
J. Anim. Sci. 31(3): 601-607. September 1970

The need for agricultural diversification with additional alternative crops and for a supply of new raw materials to industry has led to the investigation of wild plant species as possible crops. *Crambe abyssinica*, a member of the mustard family, has potential as an oil-producing crop; however, its success may depend upon the use that can be made of the byproducts. The main byproducts from *C. abyssinica* are the hulls from the seed and the meal after the oil has been extracted from the seed. Physical and chemical characteristics of the byproducts indicate they may be used as feed ingredients. The meal contains up to 49% crude protein of good quality as indicated by essential amino acid composition. The purpose of this research was to study the use of crambe meal and hulls as sources of protein and roughage, respectively, in beef cattle rations.

- 2772 • Crosslinking of Starch Xanthate. III. Reaction with Low-Molecular-Weight Polyamines
George G. Maher, M. L. Junker, J. A. Douglas, C. R. Russell, and C. E. Rist
Staerke 22(8): 249-255. August 1970

Starch xanthates of 0.11-0.55 degree of substitution (D.S.) were reacted with low-molecular-weight polyamines--hydrazine, diaminoalkanes, stearyl-polyamines, polyethylenamines, and polyethylenimines--to produce thiourethans. The progress of the reaction was followed by observing spectral absorption and viscosity changes. Often the reaction produced a gel with viscosity of 10,000-60,000 cP. The magnitude of the viscosity varied directly with increasing xanthate D.S. Increased amino- to xanthate-group ratios were necessary in the reactions with xanthates at the low end of the D.S. range to achieve much viscosity development as compared to the xanthates of highest D.S. The basicity of the amines was a factor in the rate and extent of reaction, the stronger amines being less reactive than the weaker ones.

Solid products were precipitated from the gels by ethanol. Nitrogen and sulfur analyses, as well as infrared and ultraviolet spectra, were made with these solids. From the data the D.S. and amount of crosslinking in the products were calculated. The thiourethans had a D.S. that was approximately one-half that of the starting starch xanthate.

- 2773 • Fatty Acids of *Monnina emarginata* Seed Oil
B. E. Phillips, C. R. Smith, Jr., and L. W. Tjarks
Biochim. Biophys. Acta 210(3): 353-359. September 1970

The oil of *Monnina emarginata* St. Hill seed contains three unusual acids, (*S*)-13-hydroxy-*cis*-9,*trans*-11-octadecadienoic [(*S*)-coriolic] acid (30% by weight), 13-oxo-*trans*-9,*trans*-11-octadecadienoic (0.9%), and 13-oxo-*trans*-9-octadecenoic acids (0.2%), in addition to common long-chain fatty acids.

Methyl esters of the oxygenated acids were separated from the other components by preparative thin-layer chromatography. Their structures were established by infrared, ultraviolet, and nuclear magnetic resonance spectra; by oxidative degradation; and by hydrogenation and subsequent mass spectral analysis.

The plain positive optical rotatory dispersion curve of the hydroxy ester requires that it have the L- or (*S*)-configuration.

- 2774 • Cyanolipids of *Koelreuteria paniculata* Laxm. Seed Oil
K. L. Mikolajczak, C. R. Smith, Jr., and L. W. Tjarks
Lipids 5(8): 672-677. August 1970

Koelreuteria paniculata Laxm. (Sapindaceae) seed oil is a mixture of cyanolipids (42%) and ordinary triglycerides. The cyanolipid portion contains two classes of components. One of these (25% of the oil) is a mixture of diesters composed of two fatty acid moieties (predominantly C₁₈ and C₂₀ monoenoic) esterified with an unsaturated five-carbon dihydroxynitrile (1-cyano-2-hydroxymethylprop-1-ene-3-ol). The other class (17% of the oil) consists of cyanolipids having one fatty acid moiety (predominantly C₂₀ monoenoic) esterified with 1-cyano-2-methylprop-1-ene-3-ol. Monoesters based on this same hydroxynitrile were previously isolated from *Stocksia brahuica* seed oil and characterized.

Hydrogenation of the diesters was accompanied by varying degrees of hydrogenolysis of the ester groups. The hydrogenated diester was reduced with lithium borohydride and the dihydroxynitrile portion was isolated. Acetolysis of the hydrogenated diester in glacial acetic acid with sulfuric acid catalyst yielded an acetylated γ -lactone. The double bond of the dihydroxynitrile moiety in the diester does not react with bromine in carbon tetrachloride.

- 2775 • Solubility Parameters Applied to Sedimentation Volumes of Pigments
R. L. Eissler, R. Zgol, and J. A. Stolp
J. Paint Technol. 42(548): 483-489. September 1970

Sedimentation volumes of settled dispersions of a nodular zinc oxide pigment before and after surface treatment are related to three-dimensional solubility parameters of the liquids in which settling occurred. Multiple regression analysis indicates the nature of the pigment surface and explains 86 and 90% of the variation in data for the untreated and treated pigments, respectively. Initial settling rates of the suspensions supply an essentially independent estimate of average particle radii in a number of liquids and these, in turn, were used to determine a minimum sedimentation volume. Estimated minimum volumes are within an order of magnitude of those for sediments of spherical particles in closest packing computed from information taken from the literature. Methods followed in these experiments should not only allow selection of pigments to prevent occurrence of compact, hard-to-disperse sediments in paints, but should also prove of theoretical value.

- 2776 • Polyesteramides from Linseed and Soybean Oils for Protective Coatings. Color Stability of Diisocyanate-Modified Polymers
Wilma J. Schneider, G. E. McManis, E. W. Swain, and L. E. Gast
J. Paint Technol. 42(548): 493-497. September 1970

Linseed and soybean polyesteramides containing 1.1 mole of N,N-bis(2-hydroxyethyl) fatty amide and 1 mole of either maleic anhydride or isophthalic acid were treated with 0.1 mole of tolylene diisocyanate, 1,6-hexane diisocyanate, or 4,4'-methylene bis(cyclohexyl isocyanate) to yield urethane-polyesteramides. Reflectance spectroscopy was used to determine color stability of air-dried urethane-polyesteramide films cast on a steel substrate and exposed to north window light or darkness for 2 years. Color changes were expressed by ΔE values calculated from formulas based on the Adams color space diagram. Color changes observed were influenced by polymer composition; i.e., linseed or soybean acyl groups, dibasic acid, or diisocyanate, as well as by ultraviolet absorbers, driers, and storage conditions. When exposed in the north window the urethane-polyesteramides generally colored less than a commercial control (linseed-based urethane oil); linseed films bleached somewhat from their original color. In the dark, all the polymeric films discolored. Adding an ultraviolet absorber significantly reduced color development in the soybean urethane-polyesteramide films stored in the dark.

- 2777* • Fluidization of Flour in a Stirred, Aerated Bed. Part I. General Fluidization Characteristics
R. A. Brekken,¹ E. B. Lancaster, and T. D. Wheelock¹
(¹Iowa State University, Ames)
Chem. Eng. Progr. Symp. Ser. 66(101): 81-90. 1970

The feasibility of fluidizing wheat flour in a 6-inch diameter column was investigated. This material is representative of a class of fine powders so cohesive that they cannot be fluidized by the usual methods. A slowly revolving paddle located just above the gas distributor plate broke up channels and made fluidization possible. The effects of stirrer speed, gas velocity, and bed depth on the properties of the fluidized bed and on stirrer torque were measured. Similar measurements were also made on corn starch, a mixture of flour and an antiagglomerant, and a coarse polyethylene powder for comparison. The starch was about as cohesive as the flour, whereas the polyethylene powder was free-flowing and noncohesive. The flour, starch, and the flour mixture all had essentially the same critical fluidizing velocity, which was noticeably greater than that of the coarser polyethylene powder. The critical velocity appeared to correspond to the minimum fluidizing velocity of unstirred systems, and it is independent of both bed depth and stirring speed. Other properties of the fluidized cohesive materials depend on all three parameters: gas velocity, stirrer speed, and bed depth. The dimensionless pressure drop across fluidized beds of cohesive materials is appreciably less than unity, indicating incomplete support by the rising gas and some bed structure. One of the most striking features of the flour system is a very small particle entrainment rate.

- 2778 • Biological Assays for Two Mycotoxins Produced by
Fusarium tricinctum
 H. R. Burmeister and C. W. Hesseltine
 Appl. Microbiol. 20(3): 437-440. September 1970

A survey was made to detect microorganisms useful for assaying butenolide [4-acetamido-4-hydroxy-2-butenic acid γ -lactone] and T-2 toxin [4 β ,15-diacetoxy-8 α -(3-methylbutyryloxy)-12,13-epoxytricothec-9-en-3 α -ol]. These mycotoxins produced by strains of *Fusarium tricinctum* have been implicated in mycotoxicosis of livestock. Although butenolide proved to be a very weak antibiotic, assay discs containing 100 μ g of this toxin inhibited *Spirillum serpens* NRRL B-2052, *Vibrio tyroginus* NRRL B-1033, and *Xanthomonas campestris* NRRL B-1459. T-2 toxin had no effect on 54 bacterial strains but inhibited 6 of 11 fungi. Growth of *Rhodotorula rubra* NRRL Y-7222 and *Penicillium digitatum* NRRL 1202 was retarded by assay discs containing 4 μ g of T-2 toxin. Solutions with less than 1 μ g of T-2 per ml. toxin were readily detected by a pea seed germination test. Germination was reduced more than 50% when seeds imbibed solutions of 0.5 μ g of T-2 toxin per ml. Butenolide had no effect on pea seed germination at concentrations as high as 200 μ g/ml.

- 2779 • Secondary Biosynthesis of Aflatoxin B₁ in *Aspergillus parasiticus*
 R. W. Detroy and C. W. Hesseltine
 Arch. Biochem. Biophys. 16(10): 959-963. October 1970

The effect of two inhibitors on the formation of aflatoxin B₁ synthetase activity in strain NRRL 2999 *Aspergillus parasiticus* has been studied. Aflatoxin B₁ synthesizing activity was measured *in vivo* by incorporation of the ¹⁴C-methionine methyl group into aflatoxin B₁. Cycloheximide at a concentration of 150 μ g/ml. blocks protein synthesis completely. If addition of cycloheximide is made before B₁ synthetase appears, no activity accumulates; if added during accumulation, activity is frozen at the level reached at the time of addition. The cycloheximide effect is reversible since morphogenesis, total protein synthesis, and aflatoxin B₁ synthetase activity all resume after removal of the inhibitor.

DL-*p*-Fluorophenylalanine partially inhibits aflatoxin B₁ synthesis *in vivo*; however, its effect upon macromolecular synthesis is incomplete even at high concentration levels. Once formed, the aflatoxin synthetase appears to maintain B₁ synthesis when further protein synthesis is blocked; i.e., it is not rapidly degraded.

- 2780* • Occurrence of a Mycotoxin, Ochratoxin A, in Wheat and Isolation of Ochratoxin A and Citrinin Producing Strains of *Penicillium viridicatum*
 P. M. Scott,¹ W. van Walbeek,¹ J. Harwig,¹ and D. I. Fennell
 (¹Research Laboratories, Food and Drug Directorate, Ottawa, Ontario, Canada)
 Can. J. Plant Sci. 50(5): 583-585. September 1970

Ochratoxin A is a metabolite of *Aspergillus ochraceus* Wilh. and of *Penicillium viridicatum* Westling. It is highly toxic to rats and ducklings and produces liver and kidney damage. Both *A. ochraceus* and *P. viridicatum* have been isolated from stored grain, and ochratoxin A itself was recently found in corn. The presence of this toxin in rolled wheat used as livestock feed is reported here. In addition, two strains of *P. viridicatum* that produce ochratoxin A were isolated from the wheat. One of these strains also produces citrinin, a nephrotoxin formed by several species of *Aspergillus* and *Penicillium*.

- 2781 • Free Radical Addition of Hydrogen Sulfide to Conjugated and Nonconjugated Methyl Esters and to Vegetable Oils
 A. W. Schwab and L. E. Gast
 J. Amer. Oil Chem. Soc. 47(10): 371-373. October 1970

The rate of addition of hydrogen sulfide to high purity methyl oleate, methyl linoleate, methyl linolenate, methyl 9,11-*trans,trans*-octadecadienoate and methyl β -eleostearate was investigated at 25° C. with ultraviolet (UV) irradiation. A similar study was carried out with soybean, linseed, and tung oils in the absence and presence of 2,2'-azo-bis(isobutyronitrile) with UV photolysis. Initially the reaction of hydrogen sulfide with methyl esters appears to follow pseudo-zero-order kinetics although as the reaction proceeds the kinetics of the polyunsaturated ester reactions become more complex. For nonconjugated systems the overall rate is determined by the initiation step, whereas the overall rate of addition to conjugated systems is a function of the stability of the resonance-stabilized addition radical in the chain transfer step. For methyl esters the following order of reactivity appears to hold:

Methyl oleate $\approx$ methyl linoleate $\approx$ methyl linolenate $\gg$ methyl 9,11-*trans,trans*-octadecadienoate $>$ methyl β -eleostearate. Using 2,2'-azo-bis(isobutyronitrile) with UV photolysis markedly increases the rate of addition of hydrogen sulfide to nonconjugated vegetable oils.

- 2782 • Aflatoxins M_1 and M_2 : Preparation and Purification
R. D. Stubblefield, G. M. Shannon, and O. L. Shotwell
J. Amer. Oil Chem. Soc. 47(10): 389-390. October 1970

A crude product containing aflatoxins M_1 and M_2 , as well as large quantities of aflatoxins B_1 and B_2 , obtained by fermentation of rice with *Aspergillus flavus* NRRL 3251 was chromatographed on a silicic acid column. Almost all the B_1 and B_2 were separated from M_1 and M_2 . Aflatoxins M_1 and M_2 were eluted together with ethanol-chloroform (5:95 v/v). The combined M_1 and M_2 fraction was placed on a Merck silica gel (0.05-0.2 mm.) column to be washed with hexane-chloroform (1:1 v/v) and chloroform to remove traces of B_1 and B_2 and eluted with ethanol-chloroform (1.5:98.5 v/v) to obtain aflatoxin M_1 and mixtures of M_1 and M_2 . Rechromatography of M_1 on another silica gel column gave pure M_1 which was crystallized from acetonitrile. Aflatoxin M_2 was prepared by hydrogenation of M_1 and crystallized from acetonitrile.

- 2783 • Tandem Gas Chromatography-Mass Spectrometry Analysis of Volatiles from Soybean Oil
E. Selke, Helen A. Moser, and W. K. Rohwedder
J. Amer. Oil Chem. Soc. 47(10): 393-397. October 1970

A study was made of time vs. volatile decomposition of commercially available soybean oil aged under normal laboratory room conditions. Samples were taken at weekly intervals for peroxide value (PV) determinations, organoleptic evaluations, and volatile analyses. Volatiles, stripped from the oil samples in an all-glass system devoid of connecting joints, were collected and sealed in attached capillary tubes. The encapsulated compounds were introduced into a tandem gas chromatograph-mass spectrometer via a capillary crusher. All collections, transfers, or introductions of volatiles were performed without the aid of solvents.

Hydrocarbons and, subsequently, aldehydes were the principle volatiles associated with the initial and intermediate stages of soybean oil autoxidation (PV 0-11). A variety of other compounds were also found as the level of autoxidation increased. Identified compounds, PV's and organoleptic evaluations are correlated.

- 2784 • Photoaddition of Dimethyl Sulfoxide to Polypeptides
K. Eskins and M. Friedman
Photochem. and Photobiol. 12(3): 245-247. September 1970

Ultraviolet photolysis of proteins in aqueous solutions has been extensively studied both chemically and biologically. However, the photolysis of protein in nonaqueous aprotic solvents such as dimethyl sulfoxide (DMSO) has received little attention. We now report that the photolysis of certain polypeptides in DMSO results in an increase in the sulfur content of the photoproducts which can only be due to chemical reaction of the polypeptides with the solvent, DMSO.

2785 • Intramolecular Hydrogen Bonding. An Infrared and Nuclear Magnetic Resonance Study of Diastereomeric Episulfides

K. D. Carlson, D. Weisleder, and M. E. Daxenbichler
J. Amer. Chem. Soc. 92(21): 6232-6238. October 1970

A detailed infrared and nuclear magnetic resonance study confirms the absolute configurational assignments of diastereomeric β -hydroxy (-acetoxy) episulfides. The concentration dependence of the bonded and free hydroxyl absorptions of the alcohols shows that the isomer previously assigned the 2*S*,3*R*, or *threo* configuration (I, R = H) forms the stronger intramolecular hydrogen bond ($\Delta\nu = 138 \text{ cm}^{-1}$), whereas the isomer assigned the 2*S*,3*S*, or *erythro* configuration (II, R = H, $\Delta\nu = 123 \text{ cm}^{-1}$) has a greater tendency to associate intermolecularly (dimers) in carbon tetrachloride. Chloroform may be a better solvent than generally thought for differentiating between closely related isomers that have weak internal hydrogen bonds (*ca.* 1 kcal/mole). Our results indicate that chloroform is a good solvent for estimating the relative strengths of intramolecular hydrogen bonds of the diastereomeric β -hydroxy episulfides, since chloroform efficiently disrupts interfering weaker intermolecular bonds at episulfide concentrations below 0.03 *M* while it has little effect on the intramolecular hydrogen bonds. The OH proton chemical shift for either isomer is linearly dependent upon concentration, the *threo* alcohol exhibiting a smaller limiting slope but larger limiting chemical shift compared with the *erythro* alcohol. The strong HCOH coupling ($J_{\text{HCOH}} = 9.0 \pm 0.3 \text{ Hz}$) found for the *threo* alcohol at all concentrations studied contrasts with the smaller coupling ($J_{\text{HCOH}} \approx 2\text{--}3 \text{ Hz}$) for the *erythro* isomer observed only at low concentrations ($<0.007 \text{ M}$). Magnetic nonequivalence of the methylene protons of the cyano-methyl group of the *threo* isomer can be attributed to steric factors. The methylene protons of the episulfide ring (H-4 and H-5) are part of an ABX system with H-3 in both isomers, but in the *erythro* alcohol this pattern collapses to an A_2X system in dilute chloroform solution (below 0.084 *M*) apparently as a result of specific complex formation with chloroform. Benzene-induced solvent shifts for protons of the acetates suggest a collision complex in which the benzene and episulfide rings are approximately perpendicular.

2786* • New Developments Enhance the Use of Soybean Oil

John C. Cowan

Proc. Production and Technical Division Meeting of the Potato Chip Institute International, Las Vegas, Nevada, January 31-February 4, 1966, pp. 35-39. February 1966

Soybean oil is the major food fat of our country and is used in most foods where fat is desirable. Improvements in its flavor stability have increased its outlets in shortening and margarine and in cooking and salad oils. Recent commercial and research developments show that properly processed oil can perform satisfactorily under some frying conditions but that further improvements are desirable.

2787 • Substrate Inhibition of Transglucosyl-Amylase by Maltose

L. K. Nakamura

J. Bacteriol. 104(1): 69-73. October 1970

Transglucosyl-amylase was inhibited by maltose when maltose served as a substrate. As a function of substrate concentration, the rates initially rose proportionately with increases of maltose levels until a maximal rate was attained. Further increases of maltose concentration decreased reaction rates. The attainment of a maximal rate with increasing substrate concentration and close correspondence between experimental and calculated rates indicated the involvement of ternary complex formation. Evidence also suggested that substrate inhibition is caused by maltose competing with water for the acceptor sites during complex formation.

2788 • Cyanolipids of *Cardiospermum halicacabum* L. and Other Sapindaceous Seed Oils

K. L. Mikolajczak, C. R. Smith, Jr., and L. W. Tjarks

Lipids 5(10): 812-817. October 1970

A number of sapindaceous seed oils have been investigated with respect to their cyanolipid constituents. All but one of the oils have this new class of lipids in amounts ranging from 13 to 55%. These cyanolipids are of four different types, but all consist of long-chain fatty acids esterified with an unsaturated isoprenoid hydroxy- or dihydroxynitrile.

The large amounts of C₂₀ acids usually found in these oils indicate an appreciable cyanolipid content because such acids are preferentially incorporated in nitrile-containing fractions.

Cardiospermum halicacabum L. seed oil was shown to contain 49% of a diester having two fatty acid moieties esterified with 1-cyano-2-hydroxymethylprop-2-ene-1-ol and 6% of another diester derived from 1-cyano-2-hydroxymethylprop-1-ene-3-ol. Treatment of the latter diester with methanolic hydrogen chloride produces methyl 4,4-dimethoxy-3-(methoxymethyl)butyrate from the dihydroxynitrile moiety.

2789 • Soy Food Opportunities Through Research

R. J. Dimler

Soybean Dig. 31(1): 17-23. November 1970

Increasing attention is being given to direct use of soybean protein products as human food. Plant proteins present the most immediate opportunities for an expanded protein supply. The question of ability to produce enough food draws attention to the relationship between protein source and efficiency of land use. The relatively low efficiency for animal protein results, of course, because animals must eat from six pounds to as much as 20 pounds of plant protein to produce one pound of animal protein as food.

The oilseeds as a group have the most immediate potential for increasing the supplies of food protein. Some of the food uses of soy protein are as whipping agents in confections and dessert mixes, infant foods, breakfast foods, bakery products, beverages, meat products, simulated meats, flavoring agents, and dietary foods. For most of these, soy protein has been chosen because of functional properties along with attractive price. As the virtues of soy proteins, both nutritionally and functionally, become better known we can expect ever wider acceptance of soy proteins in foods.

2790* • A Matter of Economics

Dwight L. Miller

Wheat West, pp. 8-9. January 1970

Today, production of ethyl alcohol is based on two major procedures: fermentation and chemical synthesis. For industrial use, synthetic alcohol is not a more pure or better alcohol than fermentation alcohol. Chemically, for practical purposes, both alcohols are the same. Practically all synthetic alcohol is now produced from ethylene, which is obtained from petroleum and natural gas. For fermentative production to compete with synthetic production, the wheat used would have to be priced at less than 50 cents per bushel. The suitability of wheat as a raw material for production of alcohol technically has been demonstrated by actual experience. Its use is entirely a question of economics.

2791 • Fluorodensitometric Assay of Penicillic Acid

A. Ciegler and C. P. Kurtzman

J. Chromatogr. 51(3): 511-516. September 1970

A fluorodensitometric method was developed for the quantitative analysis of penicillic acid, a toxic secondary mold metabolite. The method depends on the conversion by ammonia fumes of penicillic acid after thin-layer chromatography to a fluorescent derivative. This technique was used successfully to analyze moldy corn and a liquid fermentation for this toxin.

2792* • Occurrence of Unusual Fatty Acids in Plants

C. R. Smith, Jr.

Progr. Chem. Fats Other Lipids 11(Pt. 1): 137-177. 1970

Fatty acids derived from natural sources usually are complex mixtures of liquids or low-melting solids, and do not lend themselves readily to separation and purification by classical methods of organic chemistry. Since 1945, advances in scientific methodology and instrumentation have made possible an increasingly precise picture of the chemical composition of natural fats. In turn, these advances in technique have led to the elucidation of many new fatty acid structures and the revision of certain others reported earlier.

This review is concerned mainly with the advances in knowledge about unusual fatty acids from seed oils; however, some consideration is given to those from other plant sources. The occurrence of the acids is considered by classes. The usual fatty acids are defined, somewhat arbitrarily, as including saturates, oleic, palmitoleic, linoleic, and linolenic; all the rest are treated as unusual.

2793 • Multiple Forms of *Rhizopus oligosporus* Protease

Hwa L. Wang and C. W. Hesseltine

Arch. Biochem. Biophys. 140(2): 459-463. October 1970

Extracellular proteases of *Rhizopus oligosporus* have been purified and separated into five active fractions (A-E) by ammonium sulfate fractionation, gel filtration, or diethylaminoethyl cellulose chromatography. All fractions showed single bands on acrylamide gel electrophoresis. Preliminary characterization studies showed that the enzymes respond similarly to inhibitors and have the same pH stabilities. However, consistent differences in pH optima, temperature optima, and ratio of casein digestion to milk-clotting activity were found between two groups consisting of Fractions A, B, C and Fractions D, E. Crystalline enzymes were obtained from Fractions A and B.

2794 • Lysine Fortification of Dent Corn

C. W. Blessin, G. E. Inglett, J. F. Cavins, and W. L. Deatherage
Cereal Sci. Today 15(11): 375-377, 394. November 1970

Infusion and coating procedures were investigated for obtaining elevated, controlled levels of lysine in commercial dent corn. Infusion studies of L-lysine monohydrochloride in aqueous solutions included an examination of pH, time, temperature, and concentration. On the average, lysine content of whole corn kernels was increased from 0.24 to approximately 1% during infusion with a 15% solution of lysine at 160° F. for 30 minutes. This process may be useful in developing areas of the world where whole corn kernels are used directly for food. Lysine fortification also involved coating alkali-dehulled corn with materials that contained added lysine. Of a number of materials evaluated as coatings, zein and isolated soy protein were the most satisfactory. The amount of lysine added to the coating solution controlled the level of lysine in the product.

- 2795* • Occurrence of Mycotoxins in *Aspergillus*
 G. Semeniuk,¹ G. S. Harshfield,¹ C. W. Carlson,¹
 C. W. Hesseltine, and W. F. Kwolek²
 (¹South Dakota State University, Brookings; ²USDA
 Biometrical Services, Peoria, Ill.)
 In M. Herzberg, ed., Proc. First U.S.-Japan Conf. on Toxic
 Microorganisms, Honolulu, Hawaii, October 7-10, 1968,
 pp. 185-190. Unnumb. Pub., U.S. Dept. of Interior and UJNR
 Panels on Toxic Microorganisms. Washington, D.C. 1970

Two hundred and forty-seven cultures of 63 *Aspergillus* species from 10 to 18 taxonomic groups were each tested for mycotoxic properties on chicks and mice by feeding them molded wheat and soybeans in 50 percent diet mixes. Thirty-two cultures on one or both substrates were toxic to chicks, while 42 were toxic to mice--toxicity being defined as the death of three or more chicks or mice from the five or six on test. Nineteen cultures on one or both substrates were toxic to both chicks and mice: one each of *A. flavus* and *A. ochraceus*, two of *A. janus*, two of *A. sclerotiorum*, three of *A. quercinus*, four of *A. melleus*, and six of *A. sulphureus*. The one culture of *A. ochraceus*, two of *A. melleus*, and one of *A. sulphureus* produced much ochratoxin; the others produced trace or nondetectable amounts of this toxin. Cultures on both substrates toxic to both chicks and mice were one culture each of *A. quercinus* and *A. ochraceus*, two of *A. sclerotiorum*, three of *A. melleus*, and four of *A. sulphureus*. Thirty-two cultures were toxic only on one substrate to only one of the two animal types. Fifty-two nontoxic cultures stunted the growth of one or both animal types on one or both substrates. Gross and histological lesions were uniformly characteristic from aflatoxin-producing cultures, not from other toxigenic cultures.

- 2796* • Production of Various Aflatoxins by Strains of the
Aspergillus flavus Series
 C. W. Hesseltine, Odette L. Shotwell, Mabel Smith, J. J. Ellis,
 Elsie Vandegraft, and Gail Shannon
 In M. Herzberg, ed., Proc. First U.S.-Japan Conf. Toxic Micro-
 organisms, Honolulu, Hawaii, October 7-10, 1968, pp. 202-210.
 Unnumb. Pub., U.S. Dept. of Interior and UJNR Panels on Toxic
 Microorganisms. Washington, D.C. 1970

Sixty-seven strains of the *Aspergillus flavus* group, most of which reportedly produce aflatoxin, were grown on three different substrates under two different fermentation conditions. Yields of aflatoxin B₁, G₁, and M were determined for each fermentation. All strains that produced G₁ also produced B₁. All strains that produced aflatoxin M produced it at a ratio to B₁ of from 0.007 to 0.020. Several distinct taxa were present. Consistently 11 of 14 *A. parasiticus* strains produced all aflatoxins. In the remaining three strains, the levels of B₁ were very low and no M was

detected. A second group of five strains formed numerous large sclerotia on Czapek's agar and, likewise, formed all the aflatoxins. The third and largest group represented by *A. flavus* produced only aflatoxins B₁ and M but no G₁; in six strains no aflatoxin was detectable. One very unusual strain, which does not appear to belong to any of the groups studied, had extremely high levels of B₁ (1,257 µg./g.) but no G₁. This strain sporulates poorly and produces many small sclerotia that are much smaller than those seen in *A. flavus*.

2797 • A 1:1 Adduct of Methyl 4,6-*O*-Benzylidene-β-D-glucopyranoside and Pyridinium Chloride

Jacob Lehrfeld and James C. Goodwin

Carbohydr. Res. 14(3): 412-414. September 1970

With pyridine hydrochloride, methyl 4,6-*O*-benzylidene-β-D-glucopyranoside (I) forms a crystalline, nonhygroscopic, 1:1 adduct. Because the corresponding α isomer (II) does not form an adduct, I could be selectively removed from an acetone solution containing I and II by adding pyridine hydrochloride.

2798 • Industrial Adoptions and Accomplishments

R. J. Dimler

Rpt. Sixth Nat. Conf. Wheat Util. Res., held at Oakland, Calif., November 5-7, 1969. West. Util. Res. Develop. Div., U.S. Agr. Res. Serv., ARS 74-54, pp. 1-7. August 1970

Wheat is primarily a food grain. However, there are significant industrial uses of wheat products although the amounts involved may seem small alongside the wheat supply. This review on status of the industrial uses of wheat gives some indication how USDA utilization research has contributed to such uses. Brief comments are included on some problems relative to using wheat, in contrast to other cereal grains, as a raw material source for industry.

The industrial uses of wheat flour and starch have remained low but stable over the past 20 years. A general limitation has been the inability of wheat fractions to compete economically with similar products obtained from corn and sorghum. Occasionally the specific properties of wheat products or the advantages of location have permitted successful entry into the industrial market. Research continues to seek products that will give wheat a distinct advantage. On the other hand, new applications for starch are available to wheat whenever economics and processing facilities are favorable.

2799 • Industrial Alcohol from Wheat

Dwight L. Miller

Rpt. Sixth Nat. Conf. Wheat Util. Res., held at Oakland, Calif., November 5-7, 1969. West. Util. Res. Develop. Div., U.S. Agr. Res. Serv., ARS 74-54, pp. 20-33. August 1970

Ethyl alcohol is a member of a series of related alcohols--methyl, isopropyl, butyl, and amyl--that have many and varied uses. This evaluation of ethyl alcohol concerns its production, its markets, and particularly its possible use in motor fuels. Production of ethyl alcohol is based on two major procedures, namely, fermentation and chemical synthesis. More than 93% of ethyl alcohol produced in the United States is now prepared from cereal grains or from petroleum-based raw materials. Synthetic alcohol from petroleum has captured practically all the industrial alcohol market of 300 million gallons or more annually. These two major types of raw materials and their potentials are compared.

2800 • Pulp and Paper from Wheat Straw

Dwight L. Miller

Rpt. Sixth Nat. Conf. Wheat Util. Res., held at Oakland, Calif., November 5-7, 1969. West. Util. Res. Develop. Div., U.S. Agr. Res. Serv., ARS 74-54, pp. 34-38. August 1970

Worldwide demand for paper and paperboard in the next 15 years is expected to double. Although wood will retain its predominance, the pendulum is expected to swing slowly towards increased use of agricultural fibers. These nonwood fibers may be established raw materials as cereal straws, bagasse, and bamboo or may be new annual crops like kenaf, rosella, or sorghums.

Wheat straw was formerly an important pulping raw material in the United States. At one time, there were at least 30 plants that used wheat straw as their raw material. As late as 1950, more than 650,000 tons of pulp were produced annually from straw. Major use of the straw pulp was for strawboard, egg-case fillers, and corrugating paper. Wheat straw has no significant market for these purposes now. The reasons for this change and the hopes for future possibilities are briefly reviewed.

2801 • Starch and Flour Products in Paper and Rubber

C. R. Russell

Rpt. Sixth Nat. Conf. Wheat Util. Res., held at Oakland, Calif., November 5-7, 1969. West. Util. Res. Develop. Div., U.S. Agr. Res. Serv., ARS 74-54, pp. 122-136. August 1970

Research at the Northern Division to find new industrial outlets for cereal products has led to the development of cereal-based reinforcing agents for rubber and cationic flours for use in papermaking. Results from evaluation in the laboratory and small-scale pilot-plant processing studies indicate that prospects for large-scale industrial utilization of these new cereal products are excellent. With further work, particularly field testing and increased promotional efforts, it is believed that widespread industrial acceptance of the products will be realized. The highlights of these two developments are given.

2802 • Starch Products for Plastics and Flocculants

C. E. Rist

Rpt. Sixth Nat. Conf. Wheat Util. Res., held at Oakland, Calif., November 5-7, 1969. West. Util. Res. Develop. Div., U.S. Agr. Res. Serv., ARS 74-54, pp. 137-143. August 1970

Over the years man has modified starch by a wide variety of treatments to obtain products having special properties to serve an ever-growing number of new and useful applications. We have successfully modified starch-derived glycosides so that they can be used in making two types of plastics. One type is rigid urethane foam which is used for insulation of refrigerators, houses, storage tanks, and cold-storage warehouses. Foam may be applied as sheets or sprayed onto surfaces where surface texture is not important. A second type of urethane plastic, in the form of a floor tile, shows some promise in utilizing starch-derived glycosides. The plastic is tough, chemically resistant, clear, and transparent. Dyes may be incorporated to give tiles of any desired color. These starch-derived glycosides have a variety of potential applications in products that could utilize starch from several million bushels of grain.

At the Northern Division, we are also studying the combination of the natural polymer starch with synthetically produced polymers to make a graft copolymer. The resulting copolymers have a combination of some of the properties of starch and some of those of the grafted product. In many cases, the copolymer has properties not common to either of the two parts alone. Graft copolymers of starch with 2 to 50%, by weight, of grafted nonstarch offer one of the most promising routes now available for expanded use of starch. The graft copolymers are versatile because they can act as flocculants, thickeners, sizes, beneficiants in ore and mineral treatments, clarifiers of waste waters and sewage, and as retention aids and strengtheners in papermaking.

2803 • Prospects for Nonfood Uses of Gluten

G. E. Inglett

Rpt. Sixth Nat. Conf. Wheat Util. Res., held at Oakland, Calif., November 5-7, 1969. West. Util. Res. Develop. Div., U.S. Agr. Res. Serv., ARS 74-54, pp. 144-155. August 1970

Wheat gluten today has few nonfood applications. Such proteins as silk fibroin, casein, and to a lesser extent zein, now utilized, possess unique physical properties or economic advantages over competing materials in many nonfood uses. Wheat gluten finds difficulty competing on an economic basis; furthermore, its chemical and physical properties are not so suitable as some of the other proteins for existing markets. Greater emphasis must be given to testing and evaluating gluten products if suitable nonfood markets are to be developed. Properties must be obtained that would make the protein more suitable for fiber, film, adhesive, or unique specialty markets.

2804 • Soybean Proteins: Their Functional, Chemical, and Physical Properties

Walter J. Wolf

J. Agr. Food Chem. 18(6): 969-976. November-December 1970

Soybean proteins are available to the food industry in the form of flours and grits, concentrates, and isolates with respective protein contents of 40 to 50%, 70%, and 90% or more. These proteins, when added to a variety of foods, supply desirable functional properties, such as emulsification, fat absorption, moisture holding, thickening, and foaming. Soybean proteins are mainly globulins with minimum solubilities near pH 4.5, and consist of a mixture of components with molecular weights ranging from 8,000 to 600,000. Two of the major components, the 7S and 11S globulins, form insoluble disulfide polymers, undergo association-dissociation reactions, and have quaternary structures. The quaternary structures are disrupted by acids, alkalis, urea, detergents, and heat. Concentrated solutions of protein isolates increase in viscosity and gel when heated. Heating dilute solutions of 11S globulin causes about one-half of the protein to precipitate, while the other half is converted into a 3-4S form that remains soluble.

- 2805 • Flavor and Flatulence Factors in Soybean Protein Products
Joseph J. Rackis, David H. Honig, David J. Sessa, and
Frederic R. Steggerda¹
(¹University of Illinois, Urbana)
J. Agr. Food Chem. 18(6): 977-982. November-December 1970

Extracting 99.8% of the oil from full-fat soybean flakes with pentane-hexane removed little, if any, of the beany, bitter, green flavors. Further extraction of defatted flakes with aqueous ethanol solutions and hexane-alcohol azeotropes removed complex mixtures of lipids and most of the flavor. Although some hydroperoxides and volatile carbonyl compounds were formed during the preparation of raw, defatted flakes, no change in odor or flavor occurred. The apparent low level of oxidation that does occur, as measured by thiobarbituric acid assay, contributes little to the original soybean flavor. Gas-producing factors in soybeans reside mainly in the water-soluble, low-molecular-weight carbohydrate fraction. Human and dog experiments indicate that soybean flatulence is caused by anaerobic fermentation of carbohydrates in the ileum and colon, with egestion of high concentrations of CO₂ and H₂. Phenolic acids--syringic and ferulic--inhibit gas production *in vivo* and *in vitro*.

- 2806 • Aflatoxin B₁ Effect on Enzyme Biosynthesis in *Bacillus cereus* and *Bacillus licheniformis*
Eivind B. Lillehoj and Alex Ciegler
Can. J. Microbiol. 16(11): 1059-1065. November 1970

The influence of aflatoxin B₁ on induced and constitutive enzyme synthesis was examined in strains of *Bacillus cereus* (NRRL B-569, NRRL B-3537) and *Bacillus licheniformis* (NRRL B-3560, NRRL B-3540). Although B₁ partially blocked penicillinase elaboration in *B. cereus* after incubation with the toxin, the level of B₁-mediated reduction in total protein synthesis was similar to the diminished production of penicillinase. Comparative studies on the effects of aflatoxin B₁ and actinomycin D on enzyme synthesis and growth in *B. licheniformis* demonstrated that actinomycin D exerted a differential inhibitory influence on induction of penicillinase and α -glucosidase; whereas levels of reduction of enzyme production initiated by aflatoxin resembled toxin-mediated growth inhibition. Consequently, the mode of action of aflatoxin B₁ is not exclusively analogous to that of actinomycin D in *B. licheniformis*. However, induced-penicillinase production in *B. licheniformis* was enhanced by low levels of both actinomycin D and aflatoxin B₁.

2807 • Glycerides of *Monnina emarginata* Seed Oil

B. E. Phillips and C. R. Smith, Jr.

Biochim. Biophys. Acta 218(1): 71-82. October 1970

The seed oil of *Monnina emarginata* St. Hill was divided by thin-layer chromatography into fractions of differing polarity. The least polar fraction (63%) contained tri-acid and tetra-acid glycerides in a 1:2 mole ratio, as well as the lactone of (*S*)-13-hydroxy-*cis*-9,*trans*-11-octadecadienoic acid [(*S*)-coriolic acid]. The notable structural feature of the tetra-acid glycerides was a coriolate group with its hydroxyl esterified by long-chain acids to form estolides.

Two, more polar tetra-acid glycerides and a tri-acid glyceride with a keto acid moiety made up the fraction of intermediate polarity (5% of oil). In these glycerides, the free hydroxyl group of coriolate was esterified by 13-oxo-*trans*-9-octadecenoic acid or by an additional coriolic acid. The polar tri-acid glycerides contained 13-oxo-*trans*-9,*trans*-11-octadecadienoic acid. The most polar glycerides (25%) were tri-acid glycerides with one coriolate group.

Pancreatic lipase (EC 3.1.1.3) was used to determine the distribution of acids esterified to the α - and β -glyceride positions. The oxygenated acids were esterified predominantly (>97%) to α -glyceride positions, whereas C_{18:1} and C_{18:2} acids accounted for more than 94% of the groups esterified to β -positions.

2808 • New Names and New Combinations in the Order Actinomycetales

Buchanan 1917

T. G. Pridham

U.S. Dept. Agr., Tech. Bull. 1424, 55 pp. November 1970

During the 1960's many newly proposed names for organisms that would be placed in the order Actinomycetales Buchanan 1917 have appeared in the scientific, quasi-scientific, and patent literature. During this decade several noteworthy developments also have occurred in taxonomy of the genera and species within the order. The most important of these include (1) more objective evaluation of the morphology, excluding so-called colonial or cultural morphology, of these microorganisms; (2) elimination of some old criteria and adoption of some new ones in evaluating taxa; and (3) advances in knowledge with respect to cell wall composition. These developments have led to proposals of names for many new genera, allowed more rational comparisons of strains, and helped answer many questions.

This bulletin includes new names and new combinations proposed through June 1967, to show more accurately the true nature of these organisms cited in the contemporary literature since 1957. The format used here is suggested for future descriptions of newly proposed taxa in the order. It provides necessary information and clarifies elements that are missing in many published descriptions of newly proposed taxa.

- 2809 • Tremorgenic Toxins from *Penicillia*. I. Colorimetric Determination of Tremortins A and B
C. T. Hou, A. Ciegler, and C. W. Hesseltine
Anal. Biochem. 37(2): 422-428. October 1970

A colorimetric method is described to estimate tremorgenic mycotoxins from various *penicillia*. The assay depends upon the formation of blue color by methanolysis of the tremorgens. Both tremortin A and tremortin B after methanolysis have the same absorption maximum at 630 mμ. Ergosterol, viridicatin, and some other ether-soluble compounds showed no color reaction with this assay method. A rapid assay method for determining both tremortins in *Penicillium palitans* was achieved by combining thin-layer chromatography with the colorimetric method.

- 2810 • Extruder-Processing to Improve Nutritional Quality, Flavor, and Keeping Quality of Full-Fat Soy Flour
G. C. Mustakas, W. J. Albrecht, G. N. Bookwalter, J. E. McGhee, W. F. Kwolek,¹ and E. L. Griffin, Jr.
(¹USDA Biometrical Services, Peoria, Ill.)
Food Technol. 24(11): 1290-1296. November 1970

Extrusion-cooking, a recent process development for cooking soybeans, holds promise for converting them to a high-quality food product. The short cooking time in an extruder minimizes damage to nutritional properties but still adequately removes growth inhibitors. However, the quality of the final product depends on the process conditions used. A series of 24 extrusion-cooking experiments was carried out under various combinations of time, temperature, and moisture content to determine optimum cooking conditions in the preparation of high-quality soy flour.

Flour of high nutritive value, flavor, and good stability was prepared by dehulling and preheating unextracted soybean meats to inactivate lipoxidase, premixing with water to add moisture, extruding, cooling, drying, and grinding. Product tests showed that heat-labile nutritional factors, such as thiamine and available lysine, were maintained during processing. Inactivation of growth inhibitors was indicated by the low urease activity, trypsin inhibitor (TI), and nitrogen solubility index of the product.

Protein efficiency ratios (PER) established in 4-week rat feeding tests confirmed chemical results. PER values progressively improved up to 89% inactivation of TI. A method was developed for optimizing the extruder process variables to give good nutritive value, flavor score, and oxidative stability.

2811 • Isolation of Viridicatin from *Penicillium palitans*

Alex Ciegler and Ching T. Hou

Arch. Mikrobiol. 73(3): 261-267. September 1970

Viridicatin, $C_{15}H_{11}O_2N$, has been shown to be a metabolic product of several fungi including *P. palitans*, *P. olivino-viride*, *P. puberulum*, *P. martensii*, *P. crustosum*, *P. granulatum*, and *P. cyclopium*. Although these strains also produce the tremorgenic mycotoxin, tremortin, no toxicity could be shown for viridicatin. Viridicatin does not appear to be a component of the tremortin molecule. A quantitative colorimetric assay has been developed for viridicatin.

2812 • Origin and Development of Protein Granules in Maize Endosperm

U. Khoo and M. J. Wolf

Amer. J. Bot. 57(9): 1042-1050. October 1970

Protein granule development in the starchy endosperm of normal maize (inbred line, W46A) was studied with optical and electron microscopy. The granules were first observed 12 days after pollination as spherical deposits, usually single, within an enclosing membrane. They developed from vesicles produced by the endoplasmic reticulum and were formed both as small localized cisternal dilations and as enlargements at the ends of endoplasmic reticulum. Dictyosomes also appear to proliferate protein granule vesicles. The protein accumulated in the granules appears to be synthesized outside the membranes. Once initiated, the granules rapidly increase in size and number as the kernel develops; their final diameter ranges up to 2 μ . Immature granules stain with a variety of biological dyes in aqueous solution as well as with metal stains; mature granules stain lightly or not at all. At kernel maturity, the protein granules are embedded in a protein matrix.

2813 • Influence of the Acceptor During Transglucosylation by Transglucosylamylase of *Candida tropicalis*

L. K. Nakamura

Can. J. Biochem. 48(11): 1260-1267. November 1970

The nature of glucosidic substrates influences the fraction of glucosyl residues transferred to competing acceptors. This influence suggests that the mechanism of transglucosylation reactions catalyzed by transglucosylamylase involves the formation of intermediate ternary enzyme-glucoside-acceptor complexes. Evidence suggests that the ternary complex involving phenyl- α -D-glucose (PAG) forms and decomposes by a Random Bi Bi rather than by an Ordered Bi Bi mechanism. Polyhydroxylated compounds appear to compete better with water than do monohydroxylated substances for the acceptance of glucosyl residues that are transferred from PAG. Methanol and glycerol inhibit the breakdown of PAG noncompetitively. The alcohols have a higher affinity for the acceptor sites than does water. However, the slower decomposition rate of the alcohol ternary complex, in comparison to that of the water complex, reduces the overall breakdown rate of PAG.

2814 • Displacement of Carbohydrate Sulfonates with Halide
Ions of Toluene-Solubilized Halides

H. B. Sinclair

Carbohyd. Res. 15(1): 147-153. October 1970

Hexamethylphosphoramide was found to solubilize lithium halides in toluene. Nucleophilic displacement of carbohydrate sulfonates with these toluene-solubilized halide ions produced in excellent yield and short reaction times the corresponding deoxyhalocarbohydrate. With iodide, bromide, and chloride ions a primary methane-sulfonate needed respectively 0.25, 1, and 4 hours for the displacement. Isolated yields exceeded 70%. Displacement of secondary sulfonates was shown to occur with the solubilized halide ions.

2815 • Genus 1. *Citeromyces* Santa Maria

L. J. Wickerham

In "The Yeasts. A Taxonomic Study," ed. J. Lodder, second rev. and enlarged edition, chap. 4, pp. 121-127. Amsterdam. 1970

Citeromyces Santa Maria is included in the alphabetical discussion of 22 genera belonging to the ascomycetous yeasts. The specific format in which these genera are presented includes diagnosis of the genus, type species, classification, survey of species accepted in the genus, and systematic discussion of the species.

2816* • Genus 7. *Hansenula* H. et P. Sydow

L. J. Wickerham

In "The Yeasts. A Taxonomic Study," ed. J. Lodder, second rev. and enlarged edition, chap. 4, pp. 226-315. Amsterdam. 1970

Hansenula H. et P. Sydow is included in the alphabetical discussion of 22 genera belonging to the ascomycetous yeasts. The specific format in which these genera are presented includes diagnosis of the genus, type species, classification, survey of species accepted in the genus, and systematic discussion of the species.

2817* • Genus 14. *Pachysolen* Boidin et Adzet

L. J. Wickerham

In "The Yeasts, A Taxonomic Study," ed. J. Lodder, second rev. and enlarged edition, chap. 4, pp. 448-454. Amsterdam. 1970

Pachysolen Boidin et Adzet is included in the alphabetical discussion of 22 genera belonging to the ascomycetous yeasts. The specific format in which these genera are presented includes diagnosis of the genus, type species, classification, survey of species accepted in the genus, and systematic discussion of the species.

- 2818 • Correlation of Deoxyribonucleic Acid Base Percentages and Taxonomic Characteristics in *Hansenula*
 Lynferd J. Wickerham
 In "Recent Trends in Yeast Research," ed. D. G. Ahearn,
 chap. 2, pp. 31-47. Atlanta. 1970

The percentages of guanine + cytosine (GC) in deoxyribonucleic acids of species of *Hansenula* were compared with the number of taxonomic differences (t.d.) between consecutive pairs of species arranged in the order of decreasing GC percentages and in the order in which taxa occur in presumed phylogenetic lines within the genus. With species of the genus arranged in order of decreasing GC percentages, those consecutive pairs also in the same phylogenetic line differed by an average of 3.4 t.d., but pairs not in the same phylogenetic line averaged 8.2 t.d. per pair. With all the species and varieties of the genus arranged in order of the five phylogenetic lines constituting the genus, the average number of t.d. between consecutive taxa was 3.2. An outstanding exception to the usually close relationship between adjacent pairs in the same phylogenetic line are *Hansenula fabianii* and *Hansenula subpelliculosa*. They differ in only 2 t.d. but differ by 11% GC. Correlations between GC percentages and proton magnetic resonance spectra of mannans produced by species of *Hansenula* suggest that changes in the phylogenetic concept should be made in an important area of the genus

- 2819 • Sexuality in *Candida lipolytica*
 Lynferd J. Wickerham, Cletus P. Kurtzman, and Alberta I. Herman
 In "Recent Trends in Yeast Research," ed. D. G. Ahearn,
 chap. 6, pp. 81-92. Atlanta. 1970

The perfect form of *Candida lipolytica* was isolated as a diploid culture (strain NRRL YB-423) that produces ascospores of a wide range of sizes and shapes, including spheroidal, hemispheroidal, and shallow bowl-shaped with a ledge. Mating types were obtained from the diploid culture and also from steep water provided by the same corn processing plant from which the ascosporeogenous diploid had been isolated. One pair of mating types produced abundantly and almost exclusively a single type of ascospore, shaped like a shallow bowl. Germinability of the ascospores of diploid strain YB-423 was exceptionally low, approximately 0.1%, but germinability of ascospores produced by the pair with uniformly shaped spores was approximately 12%. Further genetic study of the species may lead to improved strains for industrial uses.

- 2820 • Infrared Absorption Spectra of Vinyl Esters of Carboxylic Acids
George E. McManis
Appl. Spectrosc. 24(5): 495-498. September-October 1970

The infrared spectra of compounds containing the vinyl ester group exhibit absorption bands that allow them to be readily distinguished from other monosubstituted ethylenic compounds and from other esters. The vinyl C=C stretching vibration is a strong sharp band at 1640 cm^{-1} , which is quite useful in analytical procedures. The C-H stretching vibrations of the vinyl ester group are observed as two weaker bands at 3117 and 3040 cm^{-1} flanking a larger sharp band at 3091 cm^{-1} . In-plane C-H deformation bands are noted at 1413 , 1291 , and 1092 cm^{-1} , while out-of-plane deformations are at 947 , 868 , and 603 cm^{-1} . The stretching vibration of the ester carbonyl is a strong sharp band at 1754 cm^{-1} . The C-O stretching region is dominated by a strong band at 1142 cm^{-1} .

- 2821 • Mature Cereal Grain Endosperm: Rapid Glass Knife Sectioning for Examination of Proteins
M. J. Wolf and U. Khoo
Stain Technol. 45(6): 277-283. November-December 1970

A simple, rapid procedure was developed by which the quality of endosperm protein in cereal grains could be evaluated by microscopic observation of the subcellular protein structure. Kernels with vitreous endosperm were sectioned without pretreatment at 3 to $4\text{ }\mu$ with a glass knife. Floury endosperm tissues were fixed in 10% glutaraldehyde, pH 7.4, for 16 hours at 5° C. , and boiled to gelatinize the starch. After drying, this tissue was sectioned as for vitreous endosperm. Sections were mounted on gelatin-coated slides and destarched with α -amylase. To identify sites of prolamine, alcohol-soluble protein was extracted for 1 hour at about 70° C. with 80% ethanol. The subcellular proteins were stained with either iodine vapor or various organic dyes. Proteins were differentiated by a combination of staining and mounting in selected high-refractive index liquids.

- 2822* • Corn in Perspective
G. E. Inglett
In "Corn: Culture, Processing, Products," ed. G. E. Inglett,
chap. 1, pp. 1-5. Westport, Conn. 1970

Corn, known botanically as *Zea mays* Linnaeus, is a green plant that utilizes sun's energy, carbon dioxide, and water containing minerals to produce one of the world's most versatile seed crops. Corn belongs to the grass family and is a cross-pollinated, monoecious plant in which the male and female flowers are located in different inflorescences on the same stalk. One or more ears develop which contain from 300 to 1,000 kernels arranged in regular rows along a cob. Besides producing the grain, the cornstalk serves as a fodder crop. In the United States the grain has evolved from an indispensable food staple during early colonial and pioneering days to the most important feed grain. Corn today is the No. 1 commodity in U.S. agriculture. It is grown on one out of every four acres of cropland.

2823* • Economics: Production and Marketing

Clarence A. Moore¹ and Philip B. Dwoskin²(¹USDA Marketing Economics Division, Peoria, Ill.; ²USDA Marketing Economics Division, Washington, D.C.)*In "Corn: Culture, Processing, Products,"* ed. G. E. Inglett, chap. 6, pp. 84-122. Westport, Conn. 1970

Corn is larger than any other crop in the United States today whether measured in bushels, acres, or dollar value. It is exceeded in cash receipts to farmers only by cattle and calves, dairy products, and hogs, in that order. Interestingly, it is the main support of those livestock enterprises, contributing in large part to their final value.

The major highlights of corn in our economy are covered in this chapter. Economic conditions involved in domestic production, marketing, utilization, and foreign trade are discussed. Past trends are presented to more fully describe corn's present contribution and indicate its future. Discussion is mainly of field corn grown for use as grain.

2824* • Kernel Structure, Composition, and Quality

G. E. Inglett

In "Corn: Culture, Processing, Products," ed. G. E. Inglett, chap. 7, pp. 123-137. Westport, Conn. 1970

Botanically, a corn kernel is known as a caryopsis--a dry one-seeded berry in which the fruit coat and seed are fused to form a single grain. Shape, size, structure, and composition of the kernel are determined by its genetic background. Mature kernels are composed of four major parts: pericarp (hull or bran), germ (embryo), endosperm, and tip cap. Principal components of whole-kernel corn are starch, proteins, and lipids. Lesser quantities of fiber, sugars, minerals, and miscellaneous organic substances including vitamins are also present. Modern agricultural practices are to harvest corn with machines that pick and shell it in the field. Since its moisture content is between 22 and 28%, such corn requires immediate conditioning. If not properly controlled, artificial drying can cause undesirable changes in the kernel. Corn that has been dried by heating to more than 140° F. exhibits stress cracks in the endosperm. This corn is easily shattered during handling. Dry milling of corn dried at air temperatures above 180° F. gives lower oil recovery, more fines with higher oil content, more flour, and a lower yield of premium-sized grits. Corn dried at 180° F. or higher is also less suitable for wet milling than properly dried kernels. Unfavorable storage of corn makes it more difficult to separate the starch from the other components by wet milling even though no apparent damage to the corn can be observed. Since some moldy corn may contain mycotoxins, such corn could be a hazard if fed to animals.

2825* • Food Uses of Corn Around the World

G. E. Inglett

In "Corn: Culture, Processing, Products," ed. G. E. Inglett, chap. 8, pp. 138-150. Westport, Conn. 1970

Modern corn processing is carried out mainly in countries that are undergoing an industrial revolution or already are highly industrialized. In many of the developing countries where corn serves as food, preparation methods are often primitive. These involve such simple operations as parching, boiling, and grinding with variations depending upon culture and geography. Mexico, Central America, South America, and Africa are the major areas where people eat corn as a main staple of their diet. It has been estimated that some 100 million people in the world who eat corn as their main food or as a major food consume it in the form of thin, round, unleavened cakes or as porridge.

2826* • Corn Wet Milling Industry

Roy A. Anderson

In "Corn: Culture, Processing, Products," ed. G. E. Inglett, chap. 9, pp. 151-170. Westport, Conn. 1970

Production of starch, oil, and feed, from corn by the wet-milling process is described.

2827* • Corn Dry Milling Industry

O. L. Brekke

In "Corn: Culture, Processing, Products," ed. G. E. Inglett, chap. 14, pp. 262-291. Westport, Conn. 1970

Current methods used for dry milling corn to produce grits, meal, and flour are reviewed. Major emphasis is on the tempering-degerming system. Brief descriptions are also included about dry deggerming and nondegerming systems. Some information is given on yields and characteristics of the products, as well as on quality aspects of corn for dry milling.

2828* • Fermentation and Distilling Industries

G. E. Inglett

In "Corn: Culture, Processing, Products," ed. G. E. Inglett, chap. 16, pp. 307-313. Westport, Conn. 1970

Corn provides many industrial fermentations a readily available, dependable, and economical source of carbohydrates. The action of appropriate yeasts, molds, or bacteria on a carbohydrate-containing substrate under controlled aerobic or anaerobic conditions is used to manufacture such useful products as alcohols, organic acids, amino acids, antibiotics, enzymes, pigments, polysaccharides, and vitamins.

Besides being used directly as an ingredient in brewing and distilling, corn provides the major commercial source of dextrose in the United States. Dextrose is produced by hydrolysis of corn starch, a product of corn wet milling. Almost 60% of wet-milled corn starch is converted to dextrose in the United States. This sugar supplies the fermentation industry with a dependable source of pure carbohydrate.

2829 • Routes to Substituted Methyl β -Maltosides

Ronald T. Sleeter and H. B. Sinclair

J. Org. Chem. 35(11): 3804-3807. November 1970

Reaction of methyl β -maltoside (1) with *p*-toluenesulfonyl (tosyl) chloride in a 1:1:1 molar ratio gave 28% of the 6,6'-ditosylate (2a) (isolated as an ethanolate 2b), 18% of the 6'-tosylate (3), and 1% of the 6-tosylate (4). Acetylation of 2a (or 2b), 3, and 4 produced the corresponding peracetates 5, 6, and 7, which on treatment with sodium iodide in acetone were converted to 6,6'-dideoxy-6,6'-diiodo acetate (8), 6'-deoxy-6'-iodo acetate (9), and 6-deoxy-6-iodo acetate (10), respectively. Catalytic hydrogenolysis of the iodo acetates 8, 9, and 10 gave the corresponding deoxy acetyl maltosides 11, 12, and 13. Reaction of methyl 2,2',3,3',4'-penta-*O*-acetyl-6,6'-di-*O*-*p*-tolylsulfonyl- β -maltoside (5) with sodium iodide in a 1:1 molar ratio produced methyl 2,2',3,3',4'-penta-*O*-acetyl-6-deoxy-6-iodo-6'-*O*-*p*-tolylsulfonyl- β -maltoside (14) as the major iodo product. Structures were assigned on the basis of catalytic hydrogenolysis of 14 to the related 6-deoxy-6'-tosylate (15), which on treatment with sodium hydroxide gave methyl 3',6'-anhydro-6-deoxy- β -maltoside (16). Structures were also assigned by nuclear magnetic resonance evidence that located the C₅-CH₃ doublet for the α anomer in a higher field than the β anomer in a 6-deoxypyranoside.

2830 • Penicillic Acid Production by Blue-Eye Fungi on Various Agricultural Commodities

Alex Ciegler and Cletus P. Kurtzman

Appl. Microbiol. 20(5): 761-764. November 1970

Of 10 *Penicillium* species reported to cause blue-eye disease of corn, four (*P. martensii*, *P. palitans*, *P. cyclopium*, *P. puberulum*) were found capable of producing the mycotoxin penicillic acid on various agricultural commodities. Commodities with high protein contents did not support toxin synthesis. The extent of toxin production varied with the strain of mold, the commodity, and the temperature; low temperatures (1° to 10° C.) favored toxin accumulation.

- 2831 • Aflatoxin B₁ Induction of Lysogenic Bacteria
 E. B. Lillehoj and A. Ciegler
 Appl. Microbiol. 20(5): 782-785. November 1970

A technique for biological verification of aflatoxin B₁ was developed based on toxin-mediated induction of lysis in a lysogenic strain of *Bacillus megaterium* NRRL B-3695. Reduction of culture turbidity was determined at various concentrations of toxin. Incubation of 1.1×10^{-4} g. (dry weight) of cells/ml. of growth medium containing 25 µg. of B₁ per ml. at 37° C. reduced initial turbidity 0.20 absorbance units in 4 hours. If the bacterial lysate of the lysogenic strain, after a 2-hour incubation with 25 µg. of B₁ per ml., was plated with a sensitive *B. megaterium* strain (NRRL B-3694), plaque-forming units increased approximately 150 times relative to the control. Comparable testing of the effects of aflatoxin on the nonlysogenic, sensitive strain demonstrated that 75 µg. of B₁ per ml. neither induced lysis nor plaque-forming units. Although induction is not an exclusive property of aflatoxin B₁, the differential response of the lysogenic and sensitive *Bacillus* strains to B₁ offers a unique and rapid technique for biological verification of the toxin.

- 2832 • Graft Copolymers of Starch and Poly(2-hydroxy-3-methacryloyl-oxypropyltrimethylammonium chloride). Preparation and Testing as Flocculating Agents
 George F. Fanta, Robert C. Burr, C. R. Russell, and C. E. Rist
 J. Appl. Polym. Sci. 14(10): 2601-2609. October 1970

The title monomer (I) has been graft polymerized onto whole wheat starch with both ceric ammonium nitrate and ferrous ammonium sulfate-hydrogen peroxide initiation. Three graft copolymers, which contained 4.5, 12.1, and 15.2% grafted poly(I), were characterized as to molecular weight of grafted branches and grafting frequency. Graft polymerization was proved by fractional precipitation. Graft copolymers were tested as flocculating agents for diatomaceous silica and nonmagnetic iron ore. The graft copolymers with 12.1 and 15.2% grafted poly(I) compared favorably in flocculating ability with a commercial high-molecular-weight cationic polyacrylamide.

- 2833 • Physiology of Sporeforming Bacteria Associated with Insects. II. Lipids of Vegetative Cells
 Lee A. Bulla, Jr., Glenn A. Bennett, and Odette L. Shotwell
 J. Bacteriol. 104(3): 1246-1253. December 1970

Lipid composition was studied in two strains each of mid-log phase cells of *Bacillus thuringiensis*, *B. larvae*, *B. popilliae*; *B. alvei*, and *B. lentimorbus*. Total lipids varied from 2.5 to 3.5% of the cell dry weight of *B. thuringiensis* to 4.3 to 5.0% of *B. popilliae*. Phospholipids in the organisms examined ranged from 55 to 79% of total lipids; neutral lipids

averaged from 13 to 45%. Common phospholipids were diphosphatidylglycerol, phosphatidylglycerol, phosphatidylethanolamine, and lysophosphatidylethanolamine. 1,2-Diglycerides, methyl esters, free fatty acids, and hydrocarbons were found in all the organisms studied. Branched-chain fatty acids constituted more than 50% of the total fatty acids in *B. thuringiensis*, *B. larvae*, *B. popilliae*, and *B. alvei*, whereas in *B. lentimorbus*, normal-chain acids constituted more than 50%. Anteiso-C₁₅ (12-methyltetradecanoate) was the most abundant acid (30 to 50%) in *B. alvei*, *B. larvae*, *B. popilliae*, and *B. lentimorbus*. In contrast, *B. thuringiensis* contained more iso-C₁₃ (7%), iso-C₁₅ (17%), normal-C₁₆ (24%), and iso-C₁₇ (18%) than anteiso-C₁₅ (6%). The distribution of individual fatty acids was similar in the phospholipids and neutral lipids of each organism. However, the total amount of iso, anteiso, and normal isomers differed.

2834 • Reducing Microbial Populations in Dry-Milled Corn Products

C. Vojnovich, V. F. Pfeifer, and E. L. Griffin, Jr.

Cereal Sci. Today 15(12): 401-404, 406-407, 411. December 1970

Corn fractions with microbial counts below 1,000 per g. can be produced from grain having a high microbial population by treating it either before dry milling, its degerminator streams, or the products after they have been separated. Screening, dry cleaning, or washing do not reduce microbial counts in corn, but these operations are necessary for sanitary milling practices. Heat treatments of corn at 180° and 212° F. temperatures decrease the microbial count in dry-milled fractions below 600 per g. Treating Beall degerminator corn streams at 212° F. drastically reduces microbial count in all milled fractions. When degerminator fines are heated at 212° F., the bacterial count drops from 1,500,000 to 260 per g. Storage of corn flour for 2 days at 145° F. decreases microbial populations from 1,500,000 to 1,000 per g.

When a mixture of degerminator fines and soil is treated with propylene oxide vapors, thermophilic spore count is lowered from 290 spores to 5 per 10 g. Microbial count is moderately reduced when corn flour is exposed to ultraviolet light.

2835 • Quantitative Analysis of Triglyceride Mixtures by Mass Spectrometry

Ronald A. Hites

Anal. Chem. 42(14): 1736-1740. December 1970

A rapid and sensitive method has been developed for determining the molecular weight distribution of triglyceride mixtures that occur naturally as fats and oils. The mass spectrum of the fat is measured by placing the sample directly into the ion source, and the consequent fractionation of the sample, caused by molecular distillation, is corrected. Triglyceride compositions have been measured for kokum and cocoa butters, olive, peanut, cottonseed, corn, soybean, sunflower, safflower, and linseed oils. When observed values were compared to theoretical values, they had a high overall correlation. Several potential applications of this mass spectral technique to problems of lipid research have been tested.

- 2836 • Thermal Degradation of 1-Deoxy-1-piperidino-D-fructose
F. D. Mills, B. G. Baker, and J. E. Hodge
Carbohydr. Res. 15(2): 205-213. November 1970

Crystalline 1-deoxy-1-piperidino-D-fructose was pyrolyzed in a sublimation apparatus at 106° and 0.1 mm. The sublimate-distillate collected consisted of piperidine acetate (43%); two piperidino derivatives of C-methyl reductone (28%); 4-hydroxy-2-piperidino-butanolactone (1.4%); and the piperidine amides of carbonic (6.5%), formic (1.6%), and acetic (5.1%) acids. Trace proportions of other volatile compounds were identified as 4-hydroxy-2,5-dimethyl-3(2H)-furanone; 2,5-dimethyl-3-piperidinofuran; 2-acetyl-3-piperidinofuran; 2-acetyl-3-piperidino-4,5-dihydrofuran; and the piperidides of glycolic, lactic, and butyric acids. Under the same pyrolysis conditions the piperidino C-methyl reductones isolated were degraded to carbonic, formic, and acetic piperidides. After separation of these compounds by preparative gas-liquid chromatography, the products were identified by mass, infrared, and proton magnetic resonance spectra; almost all were positively identified with compounds separately synthesized. The results indicate that piperidine is eliminated from C-1 and recombines at C-3 of the hexose carbon-skeleton before the primary C₄, C₂ fission occurs.

- 2837 • Predicted and Unpredicted Cross-Reactions of an Acetyl-phosphogalactan of *Sporobolomyces* Yeast. II
Michael Heidelberger¹ and Morey E. Slodki
(¹New York University Medical Center, New York)
J. Exp. Med. 132(6): 1105-1106. December 1970

Since publication of Part I, the galactan has been found to contain variable amounts of D-glucose, depending upon the conditions under which the yeast is grown. While the presence of D-glucose in no way affects the interpretation of the predicted cross-reactions and does not greatly modify the conclusions drawn from the unpredicted reactions, the latter would have been described and discussed differently had the occurrence of this sugar in the galactan been realized. The necessary revisions are made in this note.

- 2838 • Hydrogenation of Unsaturated Fatty Esters with Copper-Chromite Catalyst: Kinetics, Mechanism and Isomerization
Sambasivarao Koritala
J. Amer. Oil Chem. Soc. 47(12): 463-466. December 1970

Hydrogenation of linolenate with copper chromite produced a large amount of conjugated diene and minor amounts of nonconjugatable dienes. The double bonds in conjugated dienes and monoenes were scrambled all along the chain. This product distribution can be explained if it is assumed that conjugation of the double bonds is followed by hydrogenation. In competitive hydrogenation, fatty esters with conjugated double bonds were reduced

preferentially over fatty esters with methylene-interrupted double bonds. Isomerization of conjugated double bonds (geometric and positional) occurred more rapidly than reduction. Reduction of conjugated double bonds in the presence of deuterium resulted in a majority of the products containing no deuterium. Most of the added deuterium was incorporated into the unreacted material. Mechanisms are proposed to account for the products formed during the hydrogenation of linolenate, linoleate, and their isomers.

2839 • Flavor Evaluation of Copper-Hydrogenated Soybean Oils

J. C. Cowan, C. D. Evans, Helen A. Moser, G. R. List,
S. Koritala, K. J. Moulton, and H. J. Dutton
J. Amer. Oil Chem. Soc. 47(12): 470-474. December 1970

The use of copper catalyst to reduce selectively the linolenate in soybean oil improves its flavor stability. As previously shown, the copper must be removed or properly inactivated to obtain an oil of high initial quality. In oven and heat tests, odor and flavor development in the hydrogenated soybean oil samples correlate surprisingly well with actual levels of linolenate, but there were some differences in overall responses among cottonseed oil, copper-reduced (0.0% linolenate) and nickel-reduced (3.0% linolenate) soybean oils. The taste panel generally scored the last three oils in the following order: cottonseed oil, copper-reduced and nickel-reduced soybean oil.

2840 • Stereoselective Hydrogenation of Model Compounds and Preparation of Tailor-Made Glycerides with Chromium Tricarbonyl Complexes

E. N. Frankel, F. L. Thomas, and J. C. Cowan
J. Amer. Oil Chem. Soc. 47(12): 497-500. December 1970

Studies on the mechanism of stereoselectivity of chromium tricarbonyl catalysts with model compounds provided the basis for the preparation of simulated fats. These synthetic fats were prepared by taking advantage of the unique property of chromium carbonyl complexes to catalyze hydrogenation of polyunsaturates to *cis*-monounsaturates. Oils simulating the composition of peanut oil were produced by hydrogenating soybean oil stereoselectively to an IV of 94. Simulated olive oil was made the same way from either soybean or safflower oil hydrogenated to an IV of 82-84. Stereoselective 1,4-reduction of eleostearate in tung oil produced oils that had a high proportion of linoleate and that simulated safflower oil. The oleo-disaturated glyceride structure of cocoa butter was also simulated by selectively hydrogenating linoleate in cottonseed oil stearines and in fractionated high-palmitate stearines. Dilatometric and chromatographic studies showed that the *cis*-monoene-disaturated glyceride is the major component (60-70%) in the synthetic cocoa butter.

2841 • Epoxy Oils from Plant Seeds

F. R. Earle

J. Amer. Oil Chem. Soc. 47(12): 510-513. December 1970

Epoxy acids have been reported in seed oils from more than 60 species in 12 plant families. The discovery of 9,10-epoxyoctadec-12-ynoic and 9,10-epoxy-*trans*-3,*cis*-12-octadecadienoic acids brings to six the number of natural epoxy acids now known to occur in seed oils. These latest epoxy acids and 15,16-epoxy-*cis*-9,*cis*-12-octadecadienoic acid have been found in only one species each and at levels lower than 5% of the oil. Coronaric (9,10-epoxy-*cis*-12-octadecenoic) acid and 9,10-epoxystearic acid have been encountered in several seed oils, the first as much as 15% of the oil and the latter in only small amounts. Vernolic (12,13-epoxy-*cis*-9-octadecenoic) acid, which has been identified in numerous oils, is the only epoxy acid known to occur in seed oils at levels above 15%, and it may constitute as much as 75%. On the basis of data available to date, *Vernonia anthelmintica* appears to have the best potential for commercial production of an epoxy oil. Although one improved line has been selected, continued improvement is needed. Formation of epoxy acids in oilseeds during storage after harvest has been demonstrated, and may be partly responsible for the small amounts of epoxide detected in oils from a wide variety of seeds.

2842 • Starch-Derived Polyelectrolytes as Builders in Heavy Duty Detergent Formulations

C. A. Wilham, T. A. McGuire, A. M. Mark, and C. L. Mehltrittter
J. Amer. Oil Chem. Soc. 47(12): 522-524. December 1970

A study was made of some carboxylated starches as builders in detergent formulations that contained linear alkylbenzene sulfonate. Two types of standard soiled cotton were used with water at 300 p.p.m. hardness. Dicarboxyl starches and carboxymethyl starches having approximately two carboxyl groups per monomer unit were as effective as sodium tripolyphosphate on an equal weight basis in the detergent formulation. In a 5-day biochemical oxygen demand test these products showed low biodegradability.

2843 • Soybean Factors Relating to Gas Production by
Intestinal Bacteria

J. J. Rackis, D. J. Sessa, F. R. Steggerda,¹ T. Shimizu,¹
J. Anderson,¹ and S. L. Pearl¹

(¹University of Illinois, Urbana)

J. Food Sci. 35(5): 634-639. September-October 1970

An *in vitro* assay showed that toasted, dehulled, defatted soybean meal contains a gas-producing factor and a gas-inhibiting factor. The oligo-saccharides--sucrose, raffinose, and stachyose--are associated with the gas-producing factor when incubated in thioglycollate media with anaerobic bacteria of the intestinal tract of dogs. The phenolic acids in soybeans--syringic and ferulic acid--are effective gas inhibitors *in vitro* and in intestinal segments of dogs. The lipids, proteins, and water-insoluble polysaccharides of soybean meal have no gas activity. During fermentation, gas production parallels the formation of monosaccharides by enzymatic hydrolysis of raffinose and stachyose. The amount and composition of gas produced from cottonseed and peanut meal were comparable to soybean meal.

REPUBLICATION

- 58-G* • Production of Levoglucosan by Pyrolysis of Carbohydrates
C. M. Lakshmanan, Benjamin Gal-Or, and H. E. Hoelscher
University of Pittsburgh, Pittsburgh, Pa.
Staerke 22(7): 221-227. July 1970

This paper was originally published in Ind. Eng. Chem., Prod. Res. Develop., Vol. 8, No. 3, September 1969, pages 261-267.

- 76-G* • Production of Levoglucosan by Pyrolysis of Carbohydrates.
Pyrolysis in Hot Inert Gas Stream
C. M. Lakshmanan and H. E. Hoelscher
University of Pittsburgh, Pittsburgh, Pa.
Staerke 22(8): 261-264. August 1970

This paper was originally published in Ind. Eng. Chem., Prod. Res. Develop., Vol. 9, No. 1, March 1970, pages 57-59.

UNOFFICIAL PUBLICATIONS

Listing of Publications and Patents of the Northern Marketing and Nutrition Research Division would not be complete without including some unofficial publications. These are writings by members of the Northern Division staff, and, although written from previously published official material, are of a public service value from the standpoint of review and updating of the literature.

Low and High Shear Rotational Viscometry of Non-Newtonian Systems
R. A. Diehm and G. Earle Hamerstrand
Proceedings of 20th TAPPI Coating Conference, Minneapolis, Minnesota.
May 1969

Natural Carbohydrates: Physical and Chemical Characteristics
G. G. Maher
In "Handbook of Biochemistry and Selected Data for Molecular Biology,"
ed. H. A. Sober, 2nd ed., section D, p. D-3. Cleveland, Ohio. 1970

CONTRACT AND GRANT RESEARCH PUBLICATIONS

[Report of research work done by an outside agency under contract with the U.S. Department of Agriculture and supervised by the Northern Marketing and Nutrition Research Division.]

- 226-C* • Amino Acid Composition and Energy Value of Immature Sorghum Grain
C. W. Deyoe, F. K. Shoup, G. D. Miller, J. Bathurst, D. Liang, P. E. Sanford, and L. S. Murphy
Kansas State University, Manhattan
Cereal Chem. 47(4): 363-368. July 1970
- 229-C • The Role of Barbituric Acid in the Nutrition of *Bacillus popilliae*
Wilson H. Coulter and Ralph N. Costilow
Michigan State University, East Lansing
Can. J. Microbiol. 16(9): 801-807. September 1970
- 231-C* • Some Recent Developments in Coordination Chemistry
John C. Bailar, Jr., Hiroshi Itatani, Mary J. Crespi, and John Geldard
University of Illinois, Urbana
Advan. Chem. Ser. No. 62, pp. 103-113. 1967
- 232-C* • The Specific Debenzylation of Alkylated Carbohydrates Via Bromination-Hydrolysis
J. N. BeMiller, R. E. Wing, and Cal Y. Meyers
Southern Illinois University, Carbondale
J. Org. Chem. 33(11): 4292-4294. November 1968
- 233-C* • Methyl Terminal-4-O-methylmalto-oligosaccharides
J. N. BeMiller and R. E. Wing
Southern Illinois University, Carbondale
Carbohydr. Res. 6(2): 197-206. February 1968

[Report of research done by an outside agency under a grant from the U.S. Department of Agriculture and supervised by the Northern Marketing and Nutrition Research Division.]

- 73-G* • Monosaccharides as *O*-Glycosyl Leaving Groups from 3-Hydroxy Amino Acids During Base-Catalyzed Elimination
J. R. Vercellotti, Nancy Nienaber, and Ching Jen Chang
Marquette University, Milwaukee, Wis.
Carbohydr. Res. 13(1): 63-74. April 1970
- 74-G* • Comparison of Coomassie Brilliant Blue R 250 and Amido Black 10 B for Detection of Whey Protein Bands After Disc Electrophoresis
Nancy L. Fish, R. Mickelsen, M. E. Turner, J. L. Barnhart, and B. A. Cunningham
Kansas State University, Manhattan
J. Dairy Sci. 52(7): 1095-1097. July 1969
- 76-G* • Production of Levoglucosan by Pyrolysis of Carbohydrates. Pyrolysis in Hot Inert Gas Stream
Chambra M. Lakshmanan and Harold E. Hoelscher
University of Pittsburgh, Pittsburgh, Pa.
Ind. Eng. Chem., Prod. Res. Develop. 9(1): 57-59. March 1970
- 77-G* • Acetylated Aldosyl Chlorides by Reaction of Aldose Peracetates with Zinc Chloride-Thionyl Chloride
L. P. Egan, T. G. Squires, and J. R. Vercellotti
University of Tennessee, Knoxville
Carbohydr. Res. 14(2): 263-266. August 1970
- 78-G* • Properties of a Glucoamylase from *Aspergillus phoenicis*
D. R. Lineback and W. E. Baumann
University of Nebraska, Lincoln
Carbohydr. Res. 14(3): 341-353. September 1970
- 79-G* • Incorporation of ^{14}C into the Carbohydrate Moieties of a Fungal Glucoamylase
I. J. Russell and D. R. Lineback
University of Nebraska, Lincoln
Carbohydr. Res. 15(1): 123-135. October 1970
- 80-G • Methylene-Insertion Reactions with Unsaturated Sugars. Synthesis of 4-*C*-Cyclopropyl-*D*-ribo-tetrofuranose Derivatives
D. Horton and C. G. Tindall, Jr.
The Ohio State University, Columbus
Carbohydr. Res. 15(2): 215-232. November 1970

[Report of research work supported with funds provided by the U.S. Department of Agriculture under the Authority of U.S. Public Law 480, 83rd Congress, and sponsored by the Northern Marketing and Nutrition Research Division.]

- 309-F • Zur Genaueren Kenntnis Durch Temperatureinfluß
Modifizierter Wachsmals- und Amylosestärke
[Contribution on Waxy Maize Starch and High Amylose
Starch Modified Under the Influence of Temperature.
In German. English abstract, p. 181]
M. Blinc, A. Cimerman, E. Pertot, and D. Stucin
Slovenian Academy of Sciences and Arts, Ljubljana, Yugoslavia
Staerke 22(6): 181-188. June 1970
- 310-F • Studies on the Starches of Barley Genotypes: The
Waxy Starch
W. Banks,¹ C. T. Greenwood,¹ and J. T. Walker²
¹University of Edinburgh, Edinburgh, Scotland;
²Pentlandsfield, Scotland
Staerke 22(5): 149-152. May 1970
- 311-F • Studies on the Browning of Kori-tofu. Part III. Occurrence
of Free Amino Acids and Peptides Accompanied with Changes of
Proteins During Browning Process
Seiichi Homma, Nobuko Suzuki, Hiromichi Kato, and
Masao Fujimaki
University of Tokyo, Tokyo, Japan
Agr. Biol. Chem. 34(4): 523-531. April 1970
- 312-F • Studies on Dextrinization. Part I. Pyrodextrinization
of Corn Starch in the Absence of Any Added Catalyst
H. C. Srivastava, R. S. Parmar, and G. B. Dave
Ahmedabad Textile Industry's Research Association,
Ahmedabad, India
Staerke 22(2): 49-54. February 1970

- 313-F • Applying Proteolytic Enzymes on Soybean. Part V. A Nondialyzable Bitter Peptide in Peptic Hydrolyzate of Soybean Protein and Its Bitterness in Relation to the Chemical Structure
Soichi Arai, Michiko Yamashita, Hiromichi Kato, and Masao Fujimaki
University of Tokyo, Tokyo, Japan
Agr. Biol. Chem. 34(5): 729-738. May 1970
- 314-F • Japanese Miso-Type Products Prepared by Using Defatted Soybean Flakes and Various Carbohydrate-Containing Foods
J. Ilany-Feigenbaum, J. Diamant, Sh. Laxer, and A. Pinsky
Bar-Ilan University, Ramat-Gan, Israel
Food Technol. 23(554): 156-158. April 1969
- 315-F • Applying Proteolytic Enzymes on Soybean. Part VII. Properties of Soy Protein Treated with Microbial Acid Protease (Molsin)
Soichi Arai, Masatoshi Noguchi, Michiko Yamashita, Hiromichi Kato, and Masao Fujimaki
University of Tokyo, Tokyo, Japan
Agr. Biol. Chem. 34(9): 1338-1345. September 1970
- 316-F • Interaction of Tocored with Unsaturated Fatty Esters
Mamoru Komoda and Ichiro Harada
Sugiyama Chemical Research Institute, Tokyo, Japan
J. Amer. Oil Chem. Soc. 47(7): 249-253. July 1970
- 317-F • Specific Inhibition by *N*-Acetyl-D-galactosamine of the Interaction Between Soybean Agglutinin and Animal Cell Surfaces
Halina Lis, Ben-Ami Sela, Leo Sachs, and Nathan Sharon
The Weizmann Institute of Science, Rehovoth, Israel
Biochim. Biophys. Acta 211(3): 582-585. September 1970

- 318-F • Determination of Carbonyl Groups in Starches by Polarographic Techniques Using *O*-Phenylenediamine. V. Reactions of Periodate Oxidized Starches with *O*-Phenylenediamine
M. Takagi, M. Mizutani, T. Nishio, and S. Ono
University of Osaka Prefecture, Sakai, Japan
Staerke 22(5): 158-161. May 1970
- 319-F • Acid Hydrolysis of Soybean Oligosaccharides at the Isoelectric Point of Soybean Globulins
Sin'itiro Kawamura, Sumizo Tanusi, and Minoru Tada
Kagawa University, Takamatsu, Japan
Tech. Bull. Fac. Agr. Kagawa Univ. 21(48): 84-89.
March 1970
- 320-F • Decomposition of Soybean Oligosaccharides by Intestinal Bacteria. IV. Formation of Organic Acids from the Sugar Mixture Extracted from Defatted Soybean Meal by a Few Strains of *Escherichia coli*
Sin'itiro Kawamura, Ryuji Tada, and Tadasi Kasai
Kagawa University, Takamatsu, Japan
Tech. Bull. Fac. Agr. Kagawa Univ. 21(48): 90-103.
March 1970
- 321-F • Decomposition of Soybean Oligosaccharides by Intestinal Bacteria. V. α -Galactosidase Activity of Selected Strains of *Escherichia coli* Outside and Inside the Cell
Sin'itiro Kawamura, Hiroshi Torigoe, and Tadasi Kasai
Kagawa University, Takamatsu, Japan
Tech. Bull. Fac. Agr. Kagawa Univ. 21(48): 104-109.
March 1970

July-December 1970

.

PATENTS

[These patents are assigned to the Secretary of Agriculture. Copies of patents may be purchased (50 cents each) from the Commissioner of Patents, U.S. Patent Office, Washington, D.C. 20231. Order by number, do not send stamps.]

Reduction of Strontium-90 Content of Intact Cereal Grains

Virgil F. Pfeifer and Roy A. Anderson

U.S. Patent 3,522,056. July 28, 1970

Systemic incorporations of strontium-90 in unmilled cereal grain berries are lowered to negligible levels without attrition and without impairment of fractions in a subsequent milling thereof by washing the intact berries for several hours in a warmed dilute aqueous solution of citric acid or of phosphoric acid.

Gluten Hydrolysate Derivatives and Compositions Comprising the Same

Catherine Aranyi, Kurt Gutfreund, Ervin J. Hawrylewicz, and Joseph S. Wall

U.S. Patent 3,522,197. July 28, 1970

Epoxy and imino derivatives of the large peptide fraction of partially hydrolyzed gluten have utility as internal plasticizers for polyanhydride, epoxy, and other resins and for the preparation of a variety of specialty films and adhesives.

Acidified Ethylenimine Modified Cereál Flours

John C. Rankin and Charles R. Russell

U.S. Patent 3,522,238. July 28, 1970

Cationic pigment retention aids for use in the manufacture of paper, which aids are equally effective in both soft water and hard water, are produced by acidifying cereal grain flours that have been reacted with 2 to 3 weight percent of ethylenimine. The acidified aminoethylated cereal grain flour derivatives contain from about 1.2 grams to 1.8 grams of chemically bound ethylenimine constituent per 100 grams dry basis weight of flour and a 1% aqueous dispersion of the acidified aminoethylated cereal grain flour has a pH of between about 4.0 to 5.0.

Device for Applying a Coating of Varying Thickness

Norman E. Delfel

U.S. Patent 3,522,792. August 4, 1970

An L-shaped laterally flanged coating device having vertical walls and adapted to be moved over a substrate. The bottom edge of the trailing wall is spaced from the substrate a distance to provide a thin coating for about 75-80% of its length while the remainder of the trailing wall is further elevated from the substrate by a factor of four to five. The portion of the wall opposite the enlarged gap being recessed to provide additional coating capacity for the enlarged gap area.

Production of Bis(1,2:5,6-*O*-isopropylidene-3-*O*-thiocarbonyl- α -D-glucofuranose) Disulfide and Paper Containing Same

William M. Doane and Baruch S. Shasha

U.S. Patent 3,528,880. September 15, 1970

Quantitative yields of bis(1,2:5,6-di-*O*-isopropylidene-3-*O*-thiocarbonyl- α -D-glucofuranose) disulfide are obtained in only 1 hour from 1,2:5,6-di-*O*-isopropylidene- α -D-glucofuranose by reacting a dimethyl sulfoxide solution of the latter with sodium hydroxide and carbon disulfide, cooling the resulting solution to 5° C., adding sufficient acetic acid to neutralize excess alkali, oxidatively crosslinking the resulting xanthate to the disulfide with aqueous iodine, and extracting the desired disulfide derivative with ether.

S- β -(4-Pyridylethyl)-L-cysteine

Mendel Friedman and James F. Cavins

U.S. Patent 3,531,490. September 29, 1970

S- β -(4-Pyridylethyl)-L-cysteine, a novel amino acid produced by reacting L-cysteine and 4-vinylpyridine in the presence of triethylamine, is ninhydrin-positive and very highly resistant to acid hydrolysis. It is particularly useful as an internal standard for chromatographic analyses of basic amino acids.

Carbohydrate *trans*-Fused Cyclic Carbonate Wet-End Additives for Paper

Baruch S. Shasha, William M. Doane, and Edward I. Stout

U.S. Patent 3,536,579. October 27, 1970

Strengthening agents for wet-end addition to starch-containing papermaker's furnishes comprise the 2,3-*trans*-fused cyclic carbonate and corresponding thionocarbonate esters of methyl 4,6-*O*-benzylidene- α -D-glucopyranoside, of low-molecular-weight dextran, and of dextrin, the carbonate rings of which additives are then ruptured *in situ* by triethylamine catalyzed reaction to provide the analogous linear carbonate ester derivatives.

Calcium Sequestration in Highly Alkaline Medium

Charles L. Mehltretter

U.S. Patent 3,536,630. October 27, 1970

Remarkably improved sequestrations of calcium ions in a distinctly alkaline medium, as in the washing of milk bottles, are obtained where the sequestering agent is the known trisodium salt of dihydroxytricarballic acid.

Wet Strength Paper Comprising Starch Carbamoylethyl Ethers

Herbert E. Smith, Sherald H. Gordon, and Herbert C. Katz

U.S. Patent 3,542,644. November 24, 1970

Papers prepared from pulps containing 5% additions of carbamoylethyl ethers of starch or wheat flour that have then been crosslinked with sodium hypochlorite exhibit greatly increased wet tensile strength accompanied by less spectacular but significantly improved dry tensile and burst values.

Starch Polyethylenimino Thiourethane Reinforced Rubbers

Judith A. Douglas and George G. Maher

U.S. Patent 3,542,708. November 24, 1970

Synthetic rubbers coprecipitated from latices containing added starch polyethylenimino thiourethanes, obtained by reacting low D.S. starch xanthate and polyethylenimine, comprise tan colored, easily dewatered crumbs that can be sheeted and then vulcanized with unexpected rapidity to provide highly reinforced rubber stocks that possess greatly improved strengths and abrasion resistances comparable to those obtained with conventional reinforcing agents that are incapable of shortening the vulcanization time or of yielding lightly colored rubber.

Cis-Retaining Selective Hydrogenation of Vegetable Oils

Edwin N. Frankel

U.S. Patent 3,542,821. November 24, 1970

Arene chromium carbonyl complexes under specified conditions very selectively catalyze the hydrogenation of only the linolenate and linoleate constituents of vegetable oils or their methyl esters without also catalyzing the reduction of the oleate to stearate. Most importantly, the catalysts provide extraordinarily limited extents of double bond isomerization, and are unique in their ability to retain or direct the resulting residual ethylenically unsaturated carbon atoms almost exclusively in the original type *cis* configuration, thus permitting the production from soybean or safflower oils of stable salad oils in which the virtual absence of *trans* double bonds and a practically unchanged stearate content enable the nonwinterized oils to be refrigerated without clouding. Saponification of the so hydrogenated soybean or safflower oil or mixed methyl esters further provides a predominantly *cis* oleic acid material that closely approximates the commercial 75-85% oleic acid produced after the fractionation of animal fats.

Method for the Preparation of Amylose Acetate Dispersions

Arthur M. Mark and Charles L. Mehltrittter

U.S. Patent 3,549,619. December 22, 1970

Water-soluble food packaging films are cast from aqueous dispersions prepared by steam jet cooking high-amylose corn starch acetates of D.S. 0.21 to 0.31 at 177° C. to disintegrate the granules present. The acetates were produced in granule form by acetylating high-amylose corn starch of 70% apparent amylose content with acetic anhydride in a mixer at 90° to 95° C. for 30 minutes using 1.5% sodium hydroxide (based on dry starch) as catalyst.

LICENSING OF PATENTS

Many inventions and discoveries of the Northern Division are covered by patents assigned to the Secretary of Agriculture.

Assigned patents are available for use by business and industry under either exclusive or non-exclusive licenses. Conditions

applicable to the granting of licenses are set forth in the Federal Register, May 14, 1970 [35(94): 7493-7495]. Further information can be obtained from the Administrator, Agricultural Research Service, U.S. Department of Agriculture, Washington, D.C. 20250.

Other Divisions of
MARKETING AND NUTRITION RESEARCH
Agricultural Research Service
U.S. Department of Agriculture

Eastern Marketing and Nutrition
Research Division
600 East Mermaid Lane
Philadelphia, Pennsylvania 19118

Consumer and Food Economics
Research Division
Federal Center Building
Hyattsville, Maryland 20782

Southeastern Marketing and
Nutrition Research Division
950 College Station Road
Athens, Georgia 30604

Human Nutrition Research
Division
Agricultural Research Center
Beltsville, Maryland 20705

Southern Marketing and Nutrition
Research Division
1100 Robert E. Lee Boulevard
New Orleans, Louisiana 70119

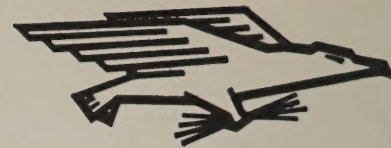
Market Quality Research
Division
Federal Center Building
Hyattsville, Maryland 20782

Western Marketing and Nutrition
Research Division
800 Buchanan Street
Albany, California 94710

Transportation and Facilities
Research Division
Federal Center Building
Hyattsville, Maryland 20782

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
NORTHERN UTILIZATION RESEARCH AND DEVELOPMENT DIVISION
1815 NORTH UNIVERSITY STREET
PEORIA, ILLINOIS 61604

OFFICIAL BUSINESS



POSTAGE AND FEES PAID
U. S. DEPARTMENT OF AGRICULTURE

